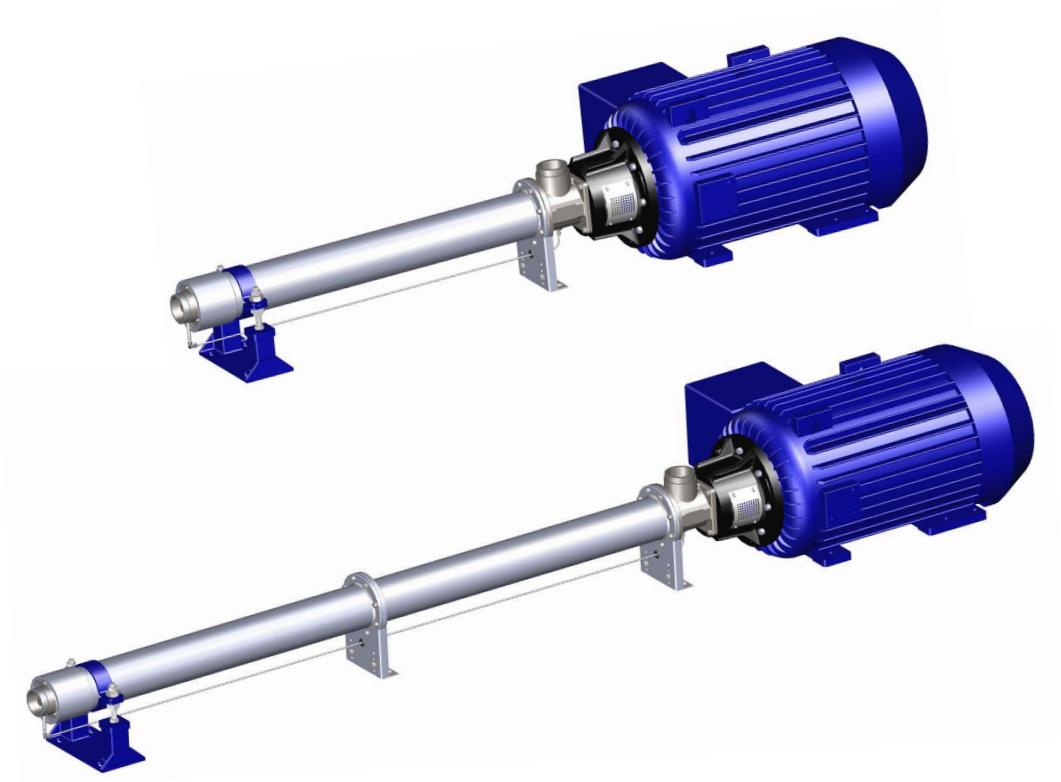
MUTLI-STAGE SEAWATER (MSS) HIGH PRESSURE PUMPS

Installation, Operation, Maintenance & Service Manual

Models: MSS-15 ● MSS-20 ● MSS-30 ● MSS-40 ● MSS-50 ● MSS-55 ● MSS-70 ● MSS-75



Register the product warranty at the time of installation by completing the Warranty Registration Form at the rear of this manual and fax or e-mail it to FEDCO.

Warranty Registration should be sent to:

ATTN: Field Service Department
FEDCO
800 Ternes Drive
Monroe, MI 48162
USA

Additional Contact Information:
Tel 734-241-3935
Fax 734-241-5173
E-mail techsupport@fedco-usa.com
Web site: http://www.fedco-usa.com/service

! IMPORTANT: FOR REASONS OF SAFETY AND MAINTENANCE, ONE COPY OF THIS MANUAL MUST REMAIN WITH THE EQUIPMENT AT ALL TIMES.

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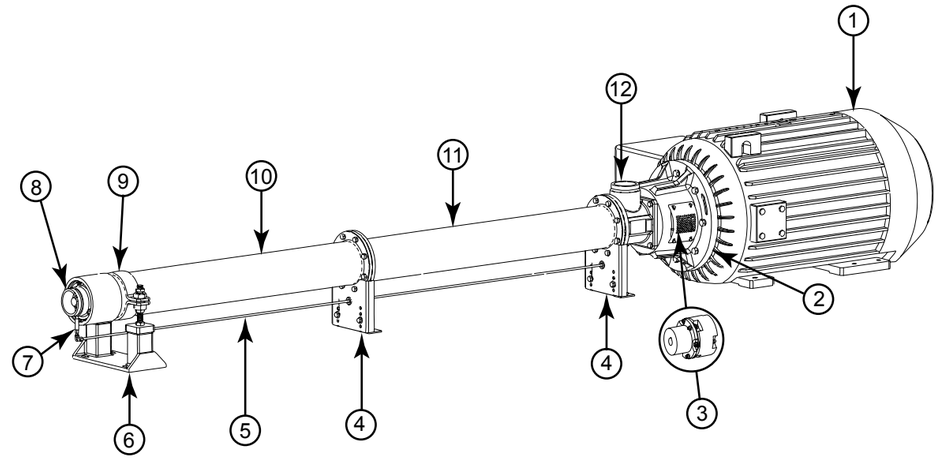
Theory and Operation

MSS Pump External Components

Multi-stage seawater (MSS) pumps are centrifugal feed pumps specifically designed for seawater reverse osmosis (SWRO) service. MSS pumps develop pressure by using a series of impellers mounted on a rotating shaft. Rotating this fluid through centrifugal force develops a pressure higher than was input. Pressure can be increased through the addition of impeller stages or by increasing shaft rpm.

Motors are selected according to equipment operating requirements (Figure 1). A flexible coupling allows the pump shaft to float within the coupling eliminating thrust against the motor. The inlet and discharge housing is designed to connect to grooved rigid piping with couplings. The inlet housing itself can be attached to the pump in four different positions 90° apart. A precision leveling foot supports the end shell housing and is fully adjustable to allow accurate pump-to-motor shaft alignment.

Typical MSS-15 through MSS-75 Pump External Components



Item	Description	Item	Description
1	Motor	7	Throttle nipple
2	Motor adapter	8	Discharge housing
3	Flexible coupling (inside of Motor Adapter	9	Top cradle
4	Support bracket	10	End Shell housing
5	Bearing drain line	11	Series Shell housing (if equipped)
6	Precision Leveling Foot	12	Inlet Housing

Figure 1 MSS Pump External Components

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Theory and Operation (cont.)

MSS Pump Internal Components

The internal components of an MSS pump can vary depending on pump configuration and number of stages. The basic components contained in a single stage consist of an impeller and a diffuser with a spacer and bushing which prevent friction and wear.

Behind the discharge housing at the end of the pump is the WATER BEARING™ assembly. (Figure 2). The balance disc rides in the bearing carrier and serves as a thrust bearing for the pump. This unique design uses patented WATER BEARING™ technology which allows feed water to cool and lubricate the balance disc.

As the motor rotates the pump, pressure differences acting on the rotating impellers generate an axial thrust acting toward the motor. The water bearing employs the balance disc to create a counter-pressure which exactly cancels the impeller thrust load. The bearing drain line and throttle nipple are used help produce the counter-pressure on the balance disc. This thrust and counter-thrust allows the disc to "self-balance" based on operating conditions.

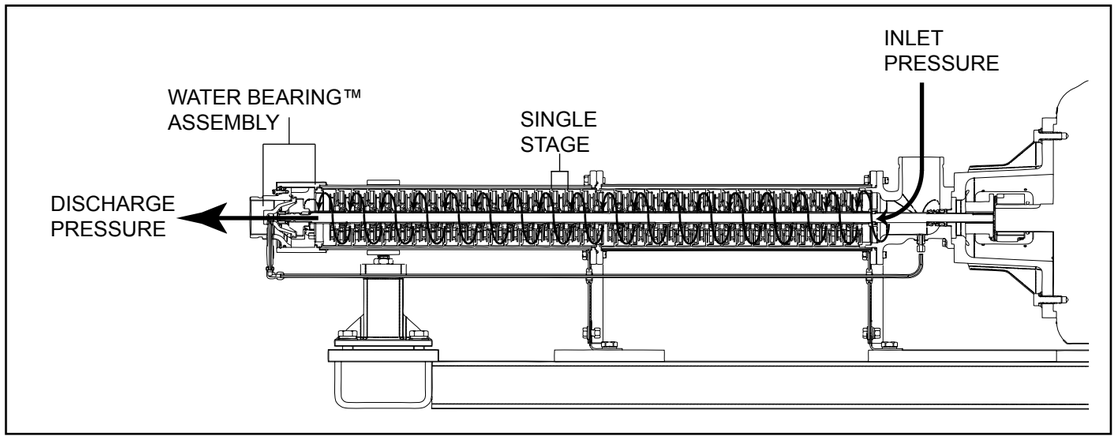

Figure 2 MSS Pump Internal Flow

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Installation Procedures

Warnings and Safety Precautions

Safety practices and precautions for the operation and maintenance of all FEDCO pump products MUST BE FOLLOWED. This information supplements oral or written instructions that may be received. Safety MUST be practiced as part of the standard operating procedures for this equipment during any installation and operation. To ensure that safe operating and maintenance procedures are followed, operators should develop and keep up a program of safety checks and current instructions. This manual contains certain operating and maintenance procedures that involve exposure to potentially hazardous situations. The levels of hazardous situations are as follows:

DANGER — **Hazards which are IMMEDIATELY ACCESSIBLE, and capable of causing SEVERE PERSONAL INJURY OR DEATH.**

WARNING — **Hazards which are NOT IMMEDIATELY ACCESSIBLE, but are capable of causing SEVERE PERSONAL INJURY OR DEATH.**

CAUTION — **Hazards which are NOT IMMEDIATELY ACCESSIBLE, and can cause PERSONAL INJURY.**

ELECTRICAL HAZARD — **Hazards which are related to Electrical Components and can RESULT IN ELECTRICAL RISKS, SHOCK, ELECTROCUTION OR DEATH if instructions are not followed properly.**

PUNCTURE HAZARD — **Hazards which are NOT IMMEDIATELY ACCESSIBLE and can RESULT IN SEVERE PERSONAL INJURY OR DEATH if instructions are not followed properly.**

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Installation Procedures (cont.)

WARNING

All pump and safety precautions must be followed to prevent physical injury to the operator. It is illegal to operate the equipment in an EU member state, which requires CE compliance, if the manual is not written in that state's language. If a translation is needed, please contact a FEDCO representative.

CAUTION

A pump is a pressure-generating device with rotating parts that can be hazardous. Any device containing generated pressure can rupture, explode or discharge its contents if it is sufficiently over-pressurized and may possibly result in personal injury, property damage, environmental damage and death. All necessary precautions must be exercised to insure over-pressurization does not occur. FEDCO will not accept responsibility for physical injury, damage or delays caused by a failure to observe the instructions in this manual.

WARNING

Installation, operation or maintenance of the pump unit in any manner which is not covered in this manual could cause damage to the equipment, serious injury or death. This includes any modification to the equipment or the use of parts not provided by FEDCO. If there is a question regarding the intended use of the equipment, please contact a FEDCO representative before proceeding.

CAUTION

This manual clearly identifies accepted methods for safe disassembly. These methods must be strictly adhered to.

WARNING

Do not use the pump equipment for a different application than originally specified without the approval of a FEDCO representative.

WARNING

NEVER operate the pump equipment:
- below the minimum flow rate.
- when dry.
- without priming.
- without proper guards and safety devices installed.
- with the discharge valve closed.
- with the suction valve closed.

ELECTRICAL HAZARD

Always follow the Lock-out / Tag-out procedure developed by your company before starting any maintenance or repair (Figure 3).

Figure 3 Typical Lock-Out Tags

User Health and Safety

Safety Equipment should be used in accordance with company regulations. The following safety equipment should be used within the work area:
- Helmet.
- Safety Glasses with shields or goggles.
- Safety Shoes.
- Protective Gloves.
- Hearing Protection is recommended.
- Follow safe lifting methods to avoid personal injury.

In the Work Area

- Always keep the work area clean and dry.
- Avoid all electrical dangers. Be aware of risks from electric shock or arc flash hazards.
- Utilize adequate lifting equipment and methods.

Electrical Connections and Regulations

- Refer to the motor nameplate for specific electrical operating information (Figure 4).
- Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations and codes.
- Insure the product is isolated from the power supply and cannot be accidentally energized.
- Make sure all thermal contacts are connected to a protection circuit according to product specifications.
- All electrical equipment must be properly grounded (Figure 5).
- During installation, service and repair, must always follow your company's Lock-out / Tag-out procedure.

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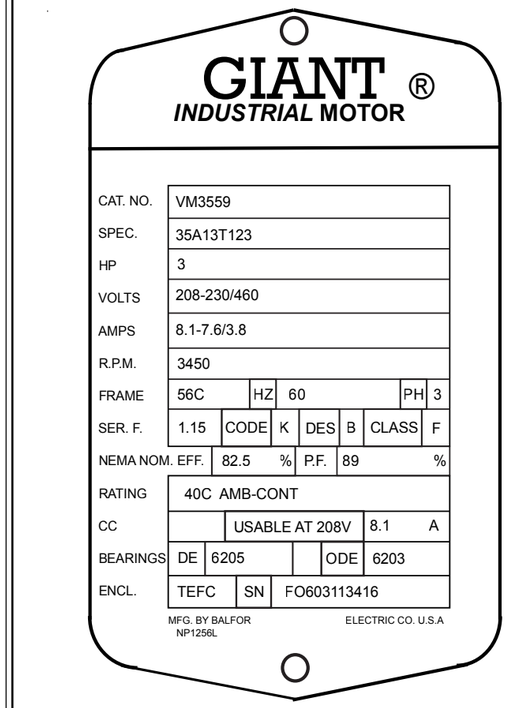

Figure 4 Typical Motor Nameplate

Motor Requirements

ELECTRICAL HAZARD

Wiring of the motor shall be completed in conformance with all local electrical codes. All EU countries must follow EN 60204-1. If a variable frequency drive (VFD) is provided with the motor, it is recommended that shielded cables are used between the VFD and the motor. The shield must be connected at both ends.

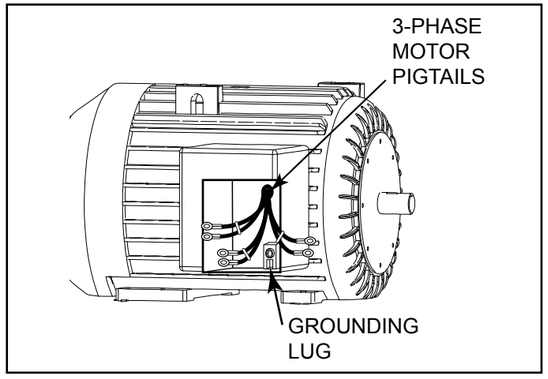

Figure 5 Typical Motor Electrical Connections

Installation Procedures (cont.)

Variable Frequency Drive (VFD) Requirements

If a VFD is used, it must be configured to match the motor nameplate information. The VFD does not come preprogramed (Figure 6). Please contact the equipment supplier if the VFD programming manual is not available. Important note for CE compliant countries: the VFD must have a line filter which must be installed in the same metallic enclosure as the drive.

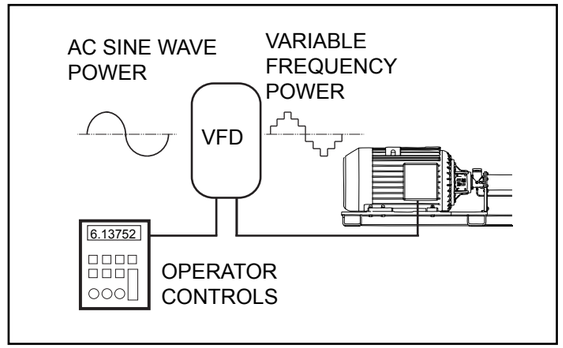

Figure 6 Basic VFD Configuration

Motor and Pump Installation Requirements

A rigid mounting surface is required for pump-motor assemblies in order to prolong the life of critical components. Mounting surfaces constructed of wood or other non-rigid materials are NOT acceptable as they may deflect during pump operation and cause shaft misalignment. All anchoring fasteners used should meet or exceed manufacturers specifications. All assemblies must be mounted on one of three types of substrates:
- concrete foundation.
- optional baseplate.
- container with a suitable steel substructure.

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Installation Procedures (cont.)

Inspection of Unit Upon Receipt

- Review the contents of the packing list to make sure all components have been included.
- Inspect all components for signs of damage which may have occurred during shipping.
- If damage is present or if the contents are incomplete, please contact your shipping company or a FEDCO representative before proceeding.

Pump Storage Requirements

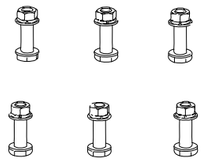
The MSS pump must be protected from sand, grit, and other foreign matter. Do not remove the protective covers from the pipe connections until ready to install. For long-term storage, keep pump and all other components in its original crate away from sand or dust.

Motor Storage Requirements

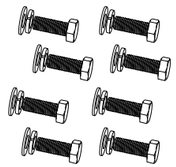
Specific conditions are required for proper motor care and storage. Refer to the motor manufacturers instructions for specific steps and instructions.

Pre-Installation

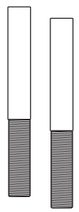
In most instances, the pump and motor are shipped in separate crates. The pump crate also contains the flexible coupling and accessories necessary for the pump-motor installation. The flexible coupling is pre-assembled and should not be disassembled. All installation accessories required can be found in either crate (Figure 7).



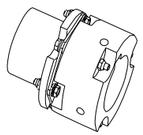
4 to 6 Motor mounting bolts with washers and nuts (if motor and baseplate is provided by FEDCO)



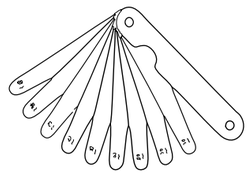
4 to 8 Motor adapter bolts with washers



2 Alignment Pins



Flexible coupling

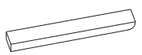


Feeler Guages

2 Flexible coupling set screws

Pump shaft key

Anit-seize compound



Motor shaft key (if motor is provided by FEDCO)

Figure 7 Installation Accessories

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Installation Procedures (cont.)

Lifting and Handling

CAUTION

Observe all lifting precautions. Failure to follow all lifting and handling precautions may result in serious injury! Unit weight is listed on the unit nameplate. Determine the weight of the unit to select an appropriate lifting method. If the weight of the pump exceeds manual lifting limits, mechanical lifting equipment must be used. MSS pumps can be lifted by the shell using approved lifting straps together with suitable lifting equipment. The straps must be installed around the shell without disturbing the drain line (Figure 9). If straps are placed around the drain line, damage can occur (Figure 8).

Pump Assembly Lifting

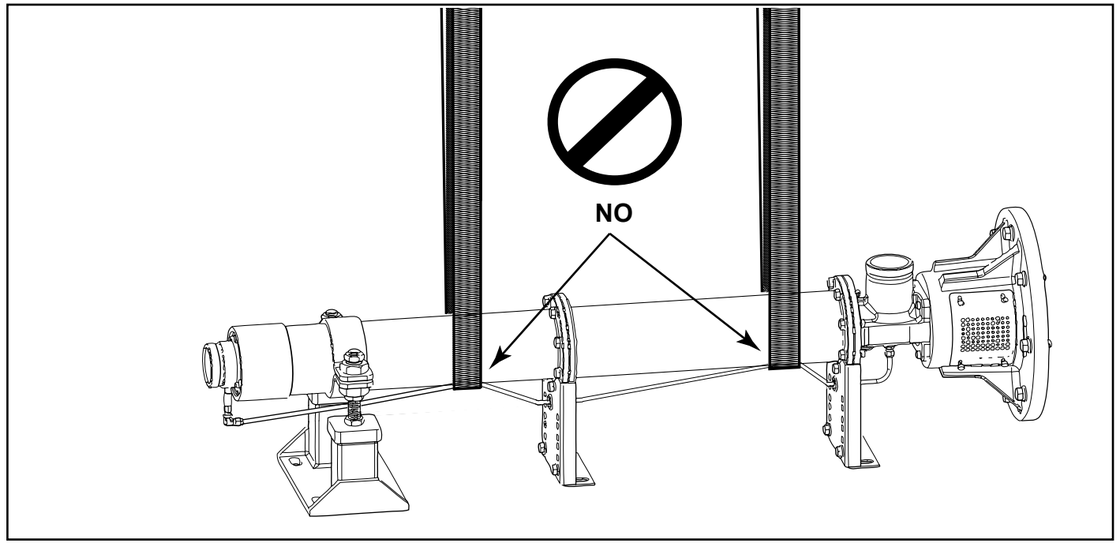

Figure 8 Improper Lifting Strap Positioning

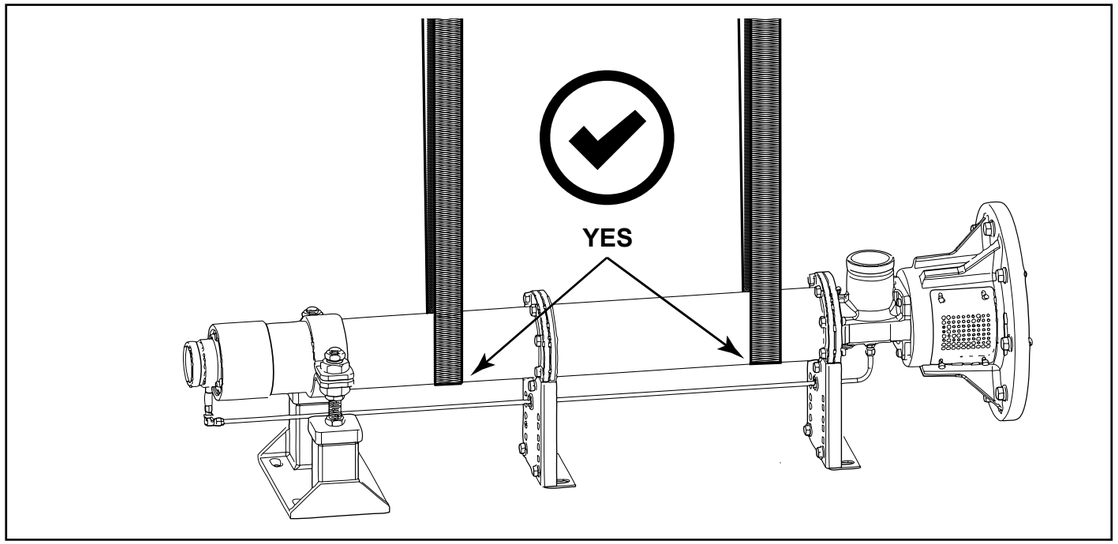

Figure 9 Proper Lifting Strap Positioning

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Installation Procedures (cont.)

CAUTION

Whenever possible, all component should be lifted and moved separately for safety. Do not lift the pump up by the shaft. If the unit is lifted by the shaft, damage may occur. Lifting and handling of the motor must be performed according manufacturers instructions. **Do not lift the pump and motor by the motor eyebolt** (Figure 10). The eyebolt is used for lifting the motor only.

Motor and Pump Assembly Lifting

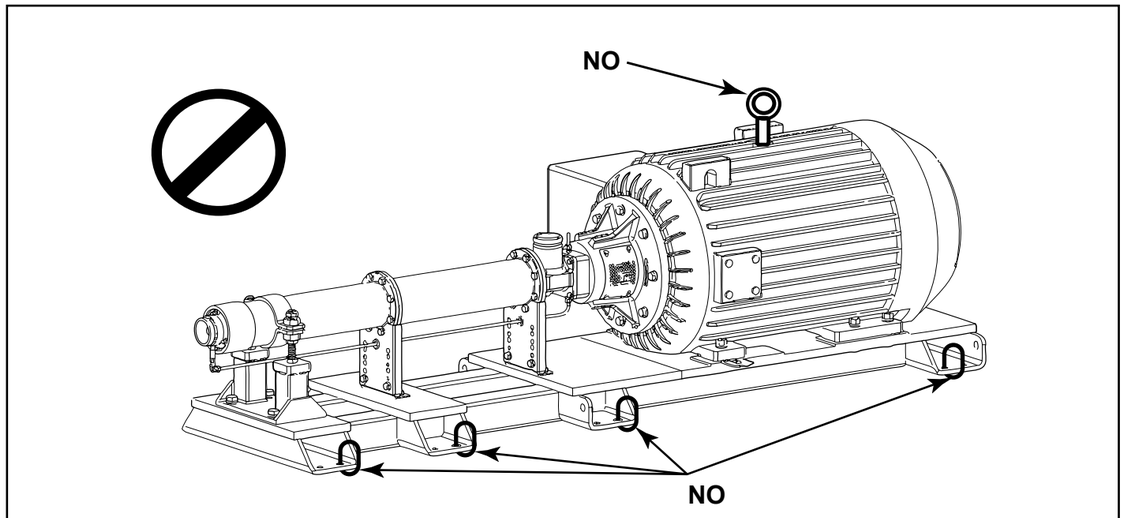

Figure 10 Improper Motor and Pump Lifting Points

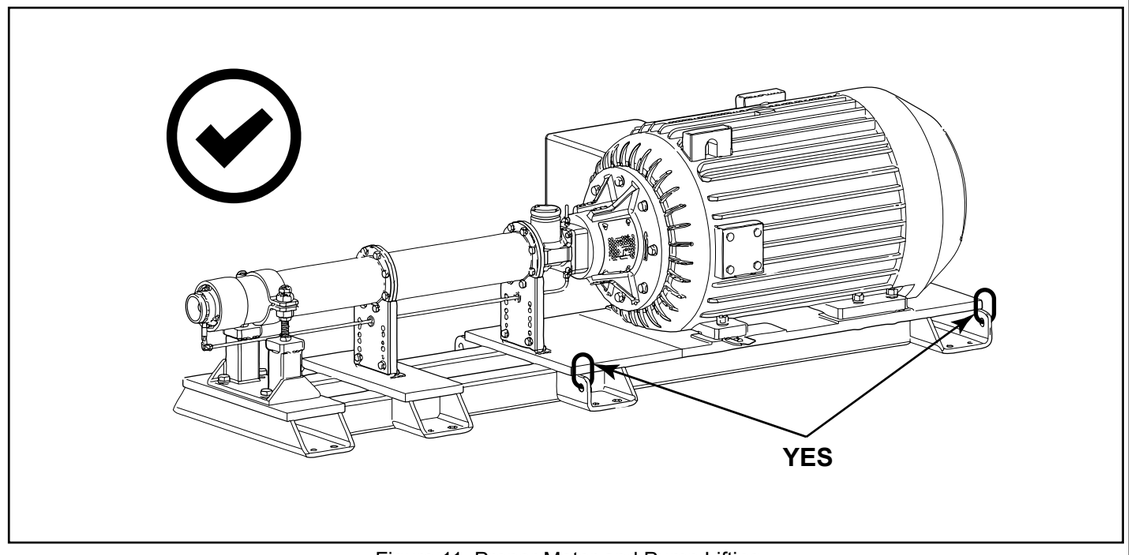

Figure 11 Proper Motor and Pump Lifting

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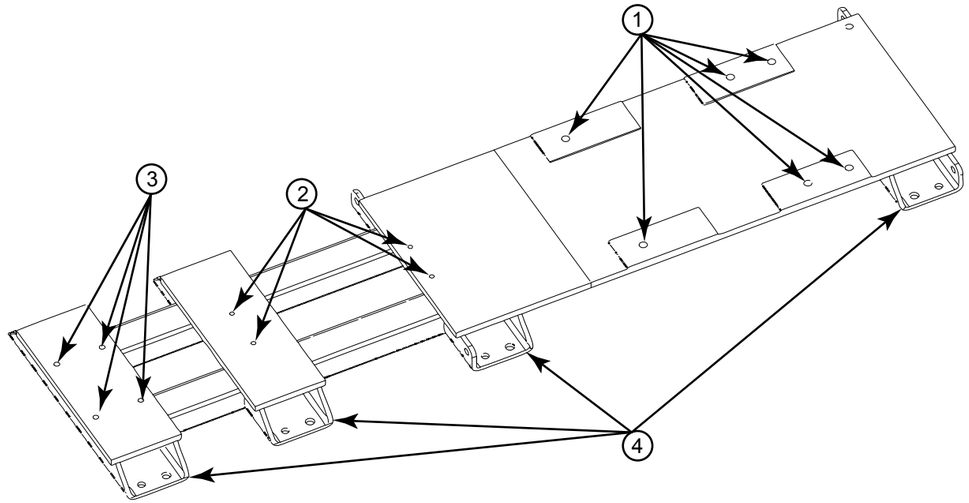
Installation Procedures (cont.)

Optional Baseplate Installation

Some units include an optional FEDCO baseplate which provides good mounting surfaces for the motor and pump (Figure 12). It also increases accuracy during the alignment process. Although the baseplate is precisely manufactured, it requires a solid foundation such as a concrete pad or rigid steel substructure. If the optional baseplate is used, it must be installed first to avoid distortion which may occur due to uneven floors or substructure (Figure 13). If the pump is installed within a container, it must be mounted on a rigid steel substructure that will not distort under the weight of the equipment or from torque reaction forces during pump operation.



Item	Descripttion	Item	Description
1	Motor mounting (4 to 6 depending on motor)	3	Precision leveling foot mounting
2	Support bracket mounting	4	Baseplate mounting feet

Figure 12 Optional Baseplate

Foundation Specifications

A concrete foundation is recommended for all MSS pump installations. Concrete provides good support and good vibration absorption. The foundation should have a mass that is 50% more than the total weight of the equipment and its perimeter should extend at least 6 inches (15 cm) on each side from the pump and motor. Make sure the concrete is completely dry and level before installing any machinery. Make sure anchor bolts and shims are properly sized and installed in cases of uneven surfaces (Figure 13).

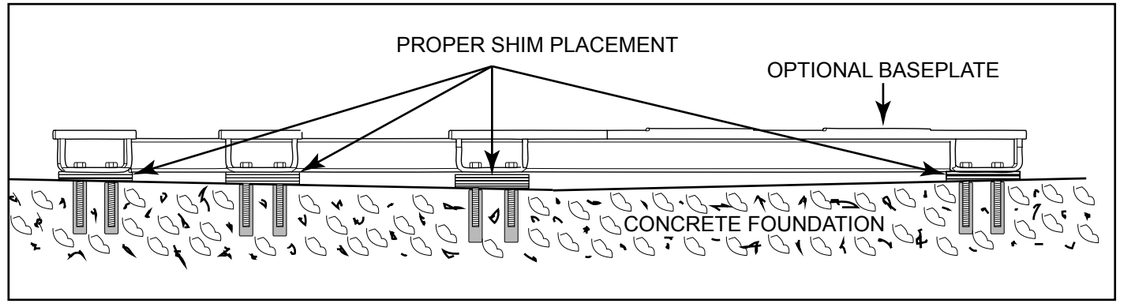


Figure 13 Proper Shimming

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Installation Procedures (cont.)

Motor Installation

1. Clean motor flange face with a clean cloth to remove any foreign matter, rust or protective coating and place motor in its mounting position. (Figure 14).

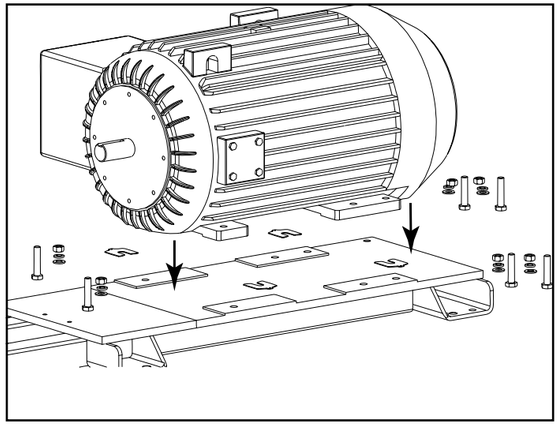

Figure 14 Placing Motor in Mounting Position

2. Install motor mounting bolts and shims as necessary (Figure 15). Tighten to motor manufacturers specifications.

   NOTE: Make sure to install shims where necessary to prevent motor frame distortion resulting from "soft-foot." Soft-foot is a condition were one of the motor frame feet are not in flat contact with the mounting base. If not properly shimmed when the bolt is tightened, the motor frame will distort.

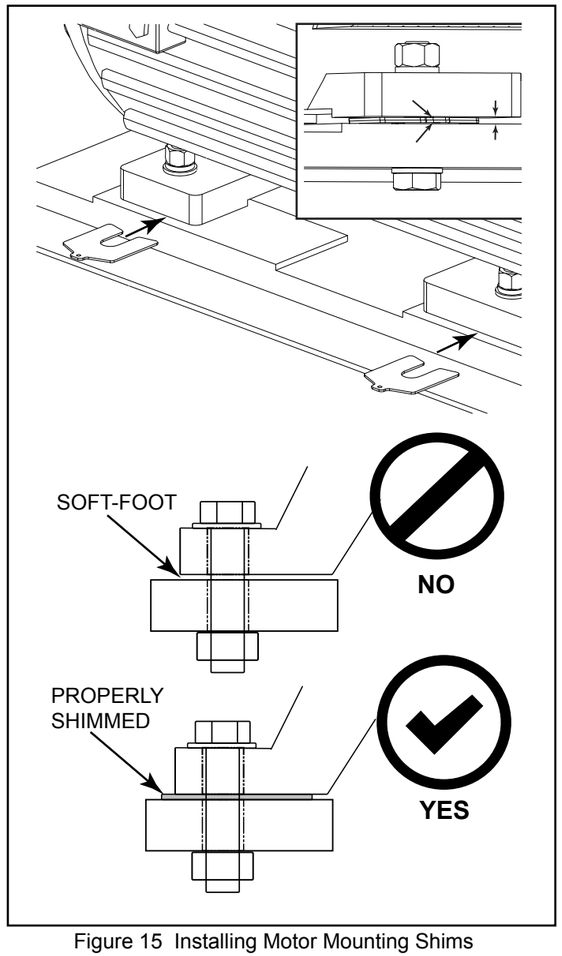

Figure 15 Installing Motor Mounting Shims

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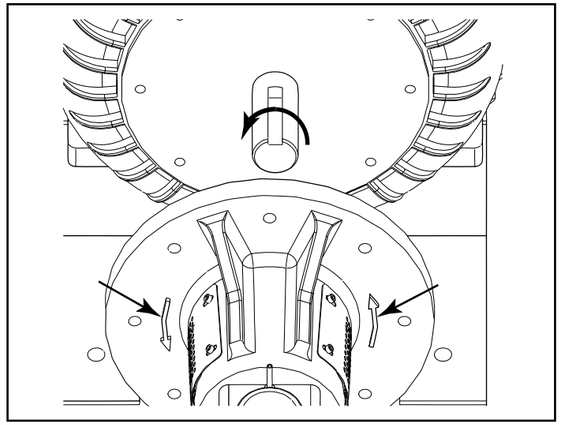

Figure 16 Directional Arrows on Motor Adapter

Installation Procedures (cont.)

Motor Rotational Direction Check

3. Prior to pump installation energize motor to determine direction of rotation. The correct rotation is indicated by arrows on pump motor adapter (Figure 16). If rotation is incorrect, reverse polarity of motor wiring to change direction of rotation.

   NOTE: Reversing polarity of VFD power input wires will not change motor rotational direction.

4. If motor rotational direction is correct, disconnect power to motor according to lock-out/tag-out procedures and complete all electrical connections according to local codes and regulations.

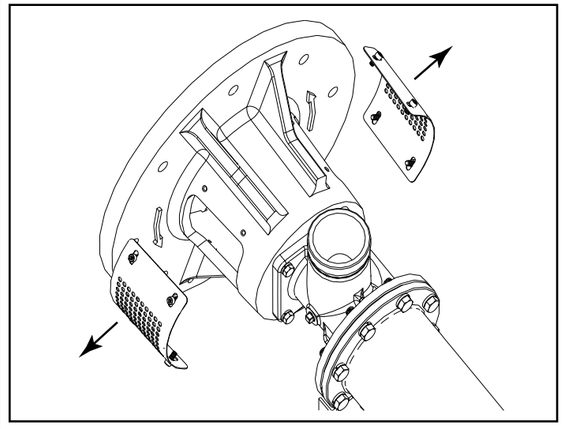

Figure 17 Removing Coupling Guards

5. Loosen eight (8) screws and remove coupling guards (Figure 17).

Flexible Coupling Check

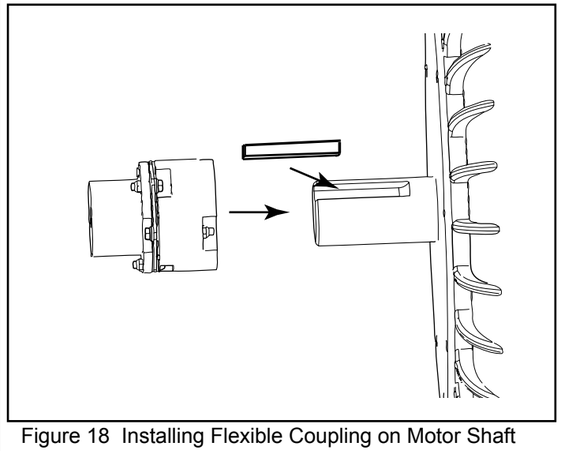

Figure 18 Installing Flexible Coupling on Motor Shaft

6. Slide flexible coupling over motor shaft with motor shaft key (Figure 18).

   NOTE: If motor shaft key does not fit properly in the coupling keyway, lightly file motor shaft key until a proper fit is obtained.

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Installation Procedures (cont.)

7. Inspect flexible coupling radial and axial fit. It should be tight with no visible radial movement and slide smoothly on and off the motor shaft (Figure 19).

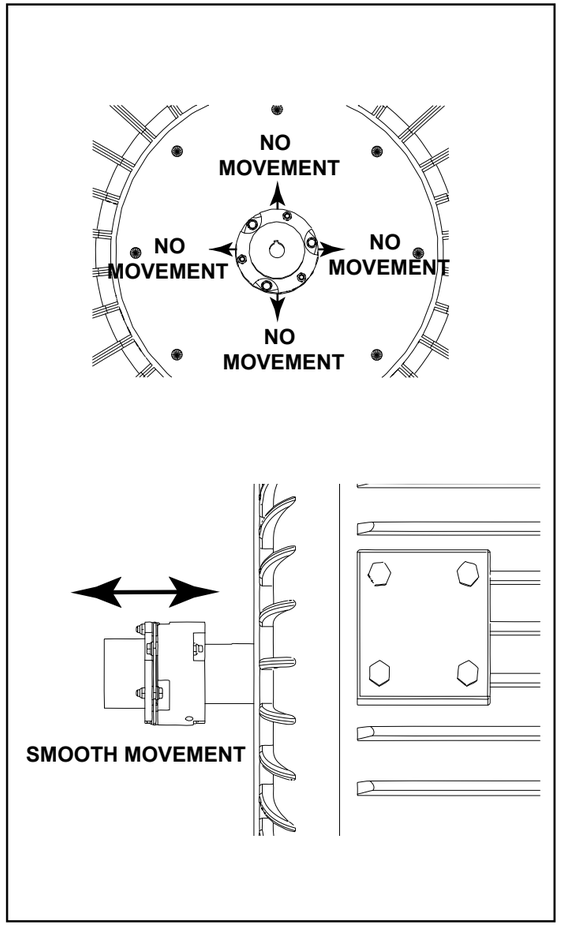

Figure 19 Checking Flexible Coupling Fit on Motor Shaft

8. Slide flexible coupling over the pump shaft with pump shaft key (Figure 20).

   NOTE: The rounded end of the key must be placed in the rounded end of the keyway.

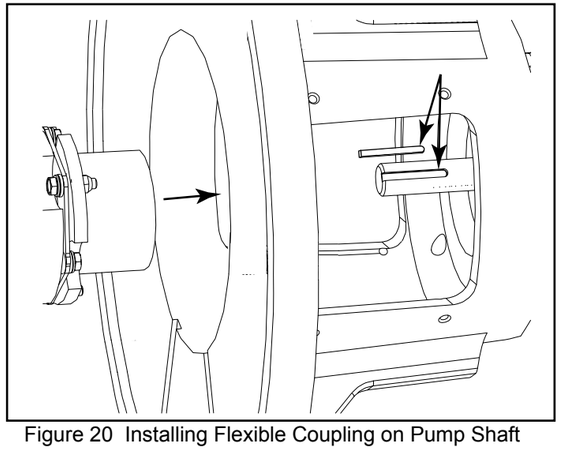

Figure 20 Installing Flexible Coupling on Pump Shaft

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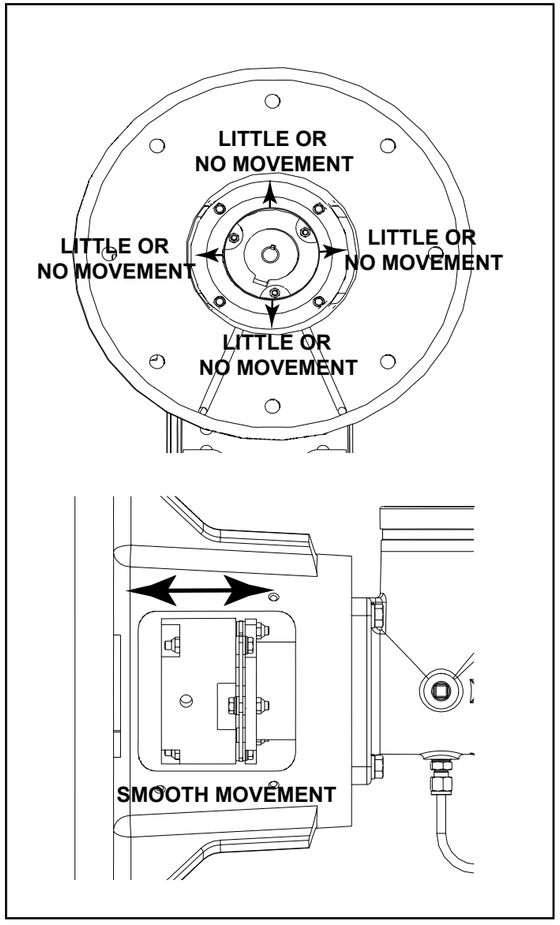

Figure 21 Checking Flexible Coupling Fit on Pump Shaft

Installation Procedures (cont.)

9. Inspect flexible coupling radial and axial fit. It should have little or no movement and slightly looser than the motor shaft fit. It should also slide smoothly on and off the pump shaft (Figure 21).

10. Once proper flexible coupling fit on both shafts has been obtained, remove the flexible coupling and proceed with Initial Pump Alignment.

    NOTE: Flexible coupling will not be needed until Final Pump Alignment procedure.

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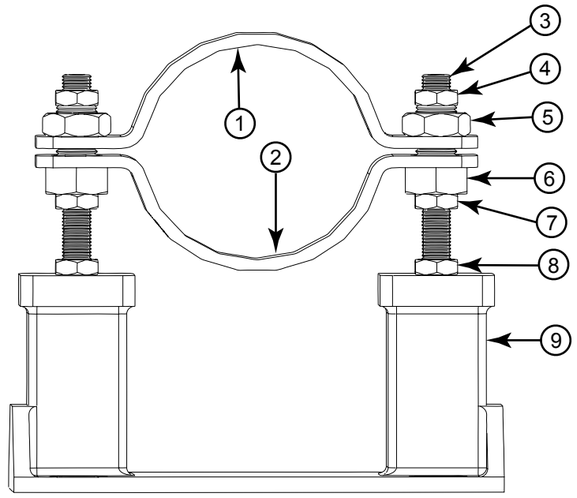
Installation Procedures (cont.)



Item	Description
1	Top cradle
2	Bottom cradle
3	Threaded rod
4	Jam nut
5	Top nut
6	Threaded rod nut
7	Adjustment nut
8	Jam nut
9	Leveling foot frame

Figure 22 Precision Leveling Foot Components

Initial Pump Alignment

11. Remove four (4) nuts and top cradle from precision leveling foot (Figure 23).

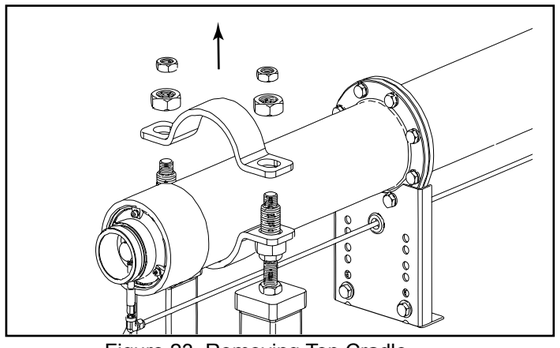


Figure 23 Removing Top Cradle

12. Install alignment pins 180° apart into motor face (Figure 24).

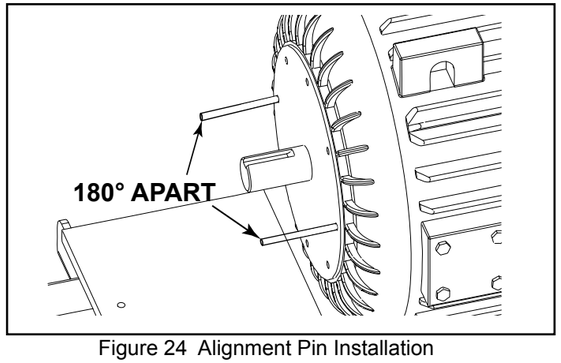


Figure 24 Alignment Pin Installation

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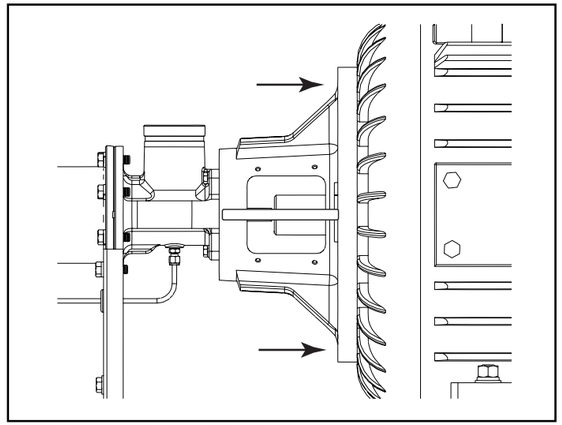

Figure 25 Positioning Pump onto Alignment Pins

Installation Procedures (cont.)

13. Carefully slide pump onto alignment pins and as close to the motor face as possible (Figure 25).

    NOTE: Depending on the motor manufacturer, a small gap may or may not be visible between the motor face and the pump adapter

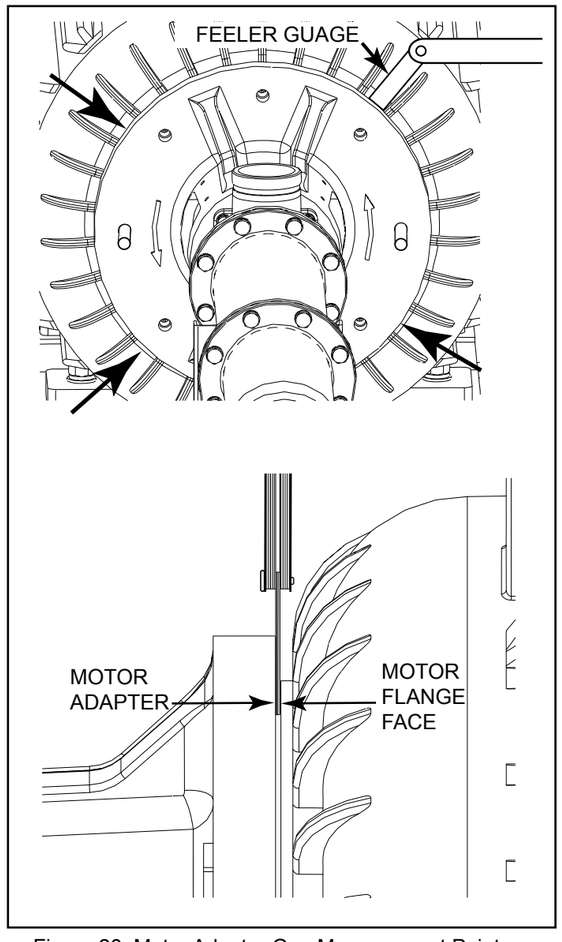

Figure 26 Motor Adapter Gap Measurement Points

14. If a gap exists between the motor adapter and motor, use feeler gauges (provided) to measure the gap at 4 different points 90° apart (Figure 26).

    NOTE: In some instances, there may be no gap between the motor and motor adapter.

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Installation Procedures (cont.)

15. Align pump by adjusting the precision leveling foot:

    A. ADJUST TOP AND BOTTOM GAP - by rotating the adjustment nuts (Figure 27).

    B. ADJUST RIGHT SIDE AND LEFT SIDE GAP - by loosening the four (4) precision leveling foot mounting bolts and moving precision leveling foot side-to-side (Figure 27).

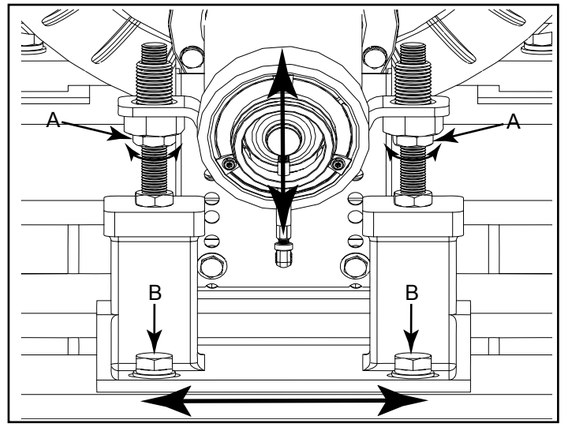

Figure 27 Precision Leveling Foot Adjustment

16. Measure the motor adapter gap and continue adjustment until the gap between the motor adapter and the motor is the same at the top and bottom (Figure 28).

    NOTE: This step is critical in properly aligning the pump with the motor. All four measurements must be the same to ensure proper pump-to-motor shaft alignment.

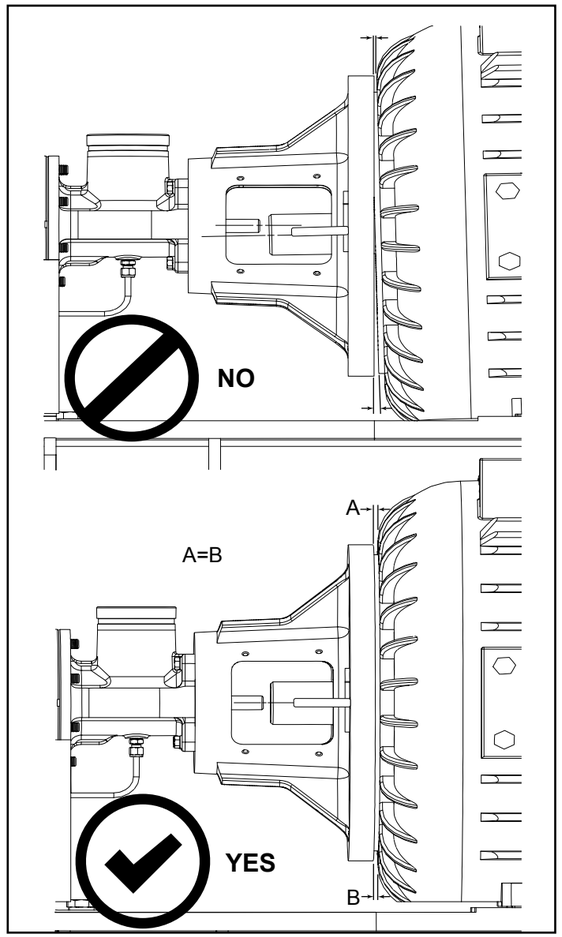

Figure 28 Proper Top and Bottom Gap

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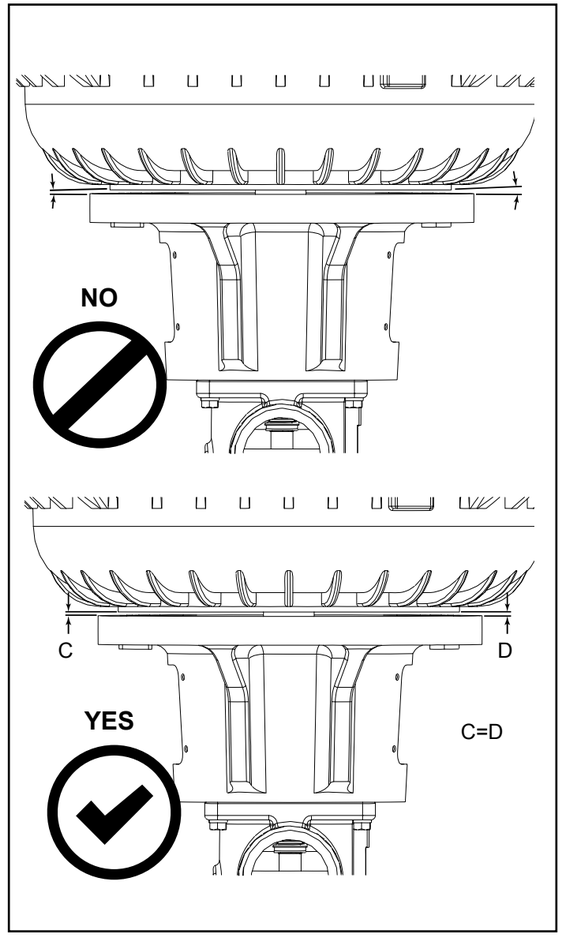

Figure 29 Proper Side-to-Side Gap

Installation Procedures (cont.)

17. Measure motor adapter gap and continue adjustment until the gap between the motor adapter and the motor is the same on both sides (Figure 29).

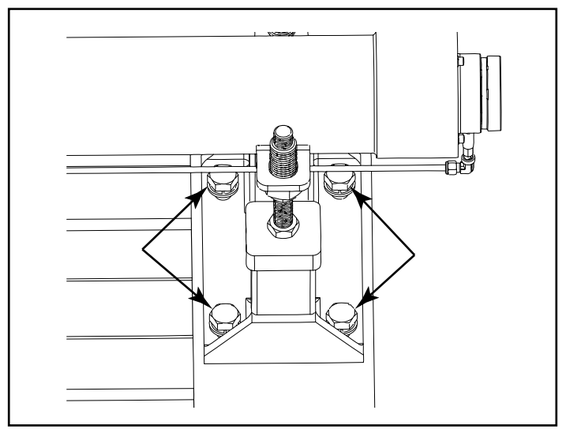

Figure 30 Securing Precision Leveling Foot

18. Secure the precision leveling foot to foundation with four (4) bolts, washers and tighten to specification for the size bolts used (Figure 30).

    NOTE: Do not secure the support brackets at this time.

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Installation Procedures (cont.)

19. Carefully slide pump away from the motor and proceed to the Final Pump Alignment procedure.

    NOTE: Make sure pump is well supported and slide pump far enough to provide sufficient room to install flexible coupling (Figure 31).

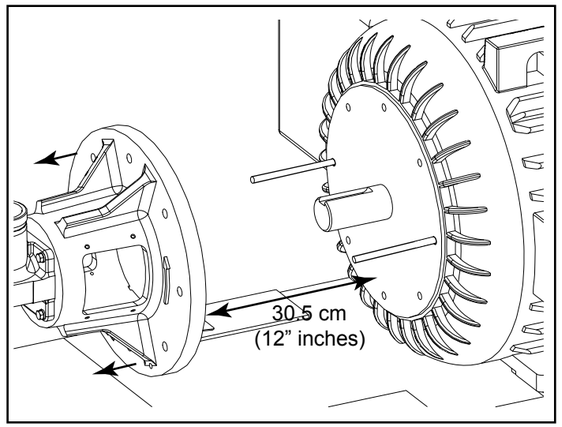

Figure 31 Separating Pump from Motor

Final Pump Alignment

20. Apply system compliant anti-seize compound on motor shaft and install motor shaft key in shaft keyway (Figure 32).

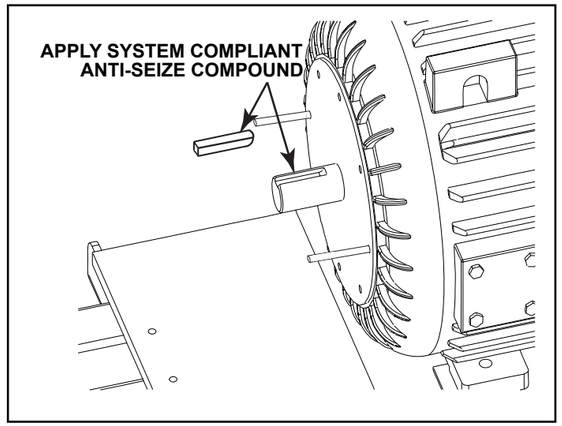

Figure 32 Installing Motor Shaft Key

21. Slide the flexible coupling onto the motor shaft until the end of the motor shaft is flush with the end of the motor half of the flexible coupling (Figure 33).

    NOTE: The motor shaft and its key should NOT be touching the plates of the flexible coupling disc pack. Ensure that the motor shaft key does not slide out of place or project past the end of the motor shaft.

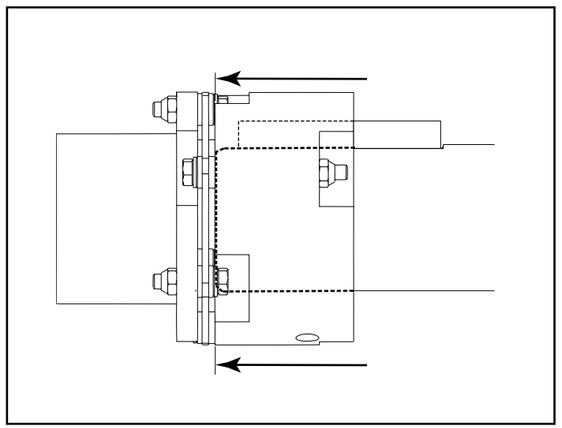

Figure 33 Positioning Flexible Coupling on Motor Shaft

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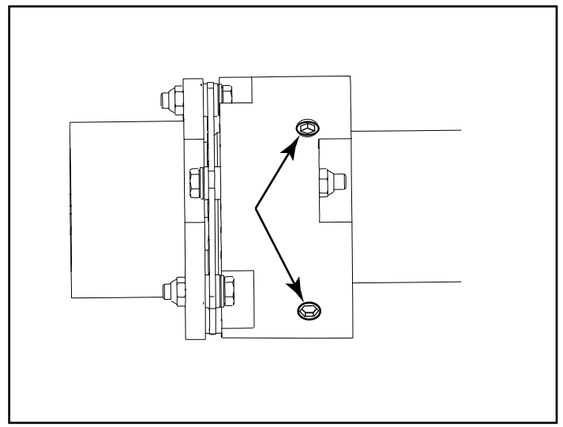

Figure 34 Flexible Coupling Set Screw Locations

Installation Procedures (cont.)

22. Install two (2) set screws and tighten (Figure 34).

    NOTE: Set screws are only on the motor side of the flexible coupling. NO set screws should be installed on the pump shaft side of the coupling.

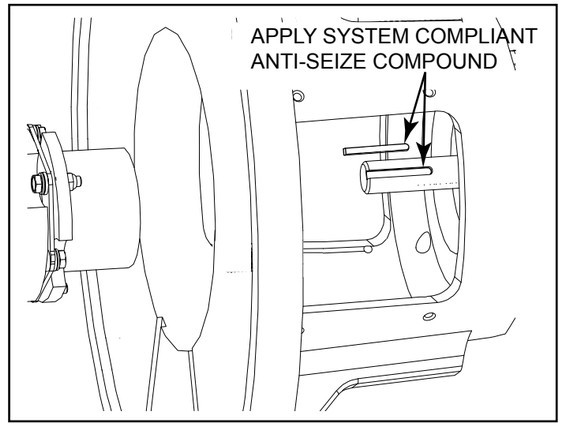

Figure 35 Pump Shaft Key Installation

23. Apply system compliant anti-seize compound on pump shaft and install pump shaft key (Figure 35).

    NOTE: The rounded end of the key must be placed in the rounded end of the keyway.

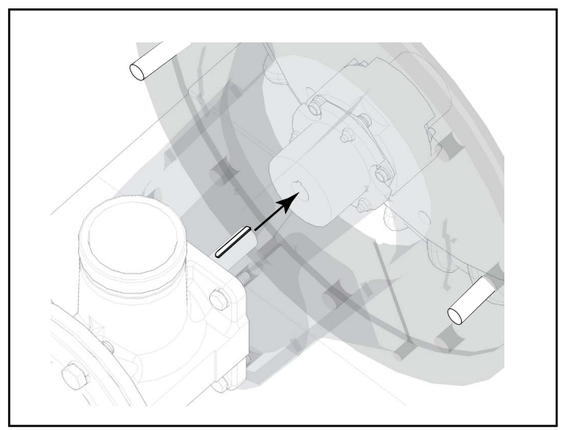

Figure 36 Aligning Pump Shaft Keyway

24. Rotate both shafts until the pump shaft key and the flexible coupling keyway are on top and aligned (Figure 36).

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Installation Procedures (cont.)

25. Carefully slide pump against motor making sure the pump shaft key slides smoothly into the flexible coupling. Push pump by hand until motor adapter and motor are in contact (Figure 37).

    NOTE: Make sure pump shaft key does not jam or fall out during installation.

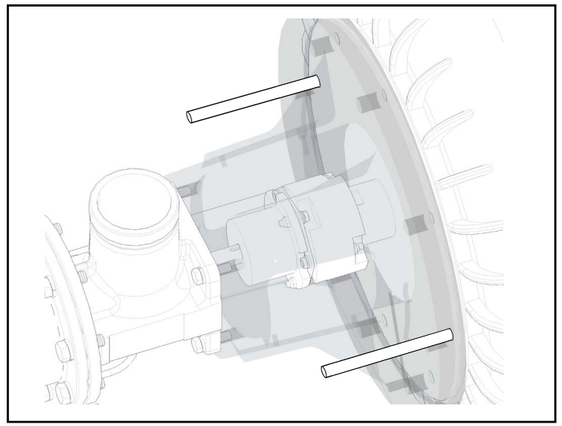

Figure 37 Position Pump for Final Alignment

26. Using feeler gauges, re-measure any gap between the motor adapter and motor at 4 different points 90° apart around the motor adapter (Figure 38).

    NOTE: In some instances, there may be no gap between the motor and motor adapter.

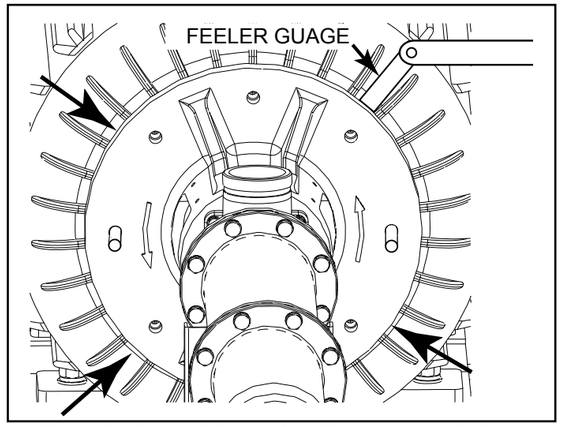

Figure 38 Motor Adapter Gap Measurement Points

27. If uneven gaps exist, adjust the precision leveling foot as necessary until any gaps between motor and motor adapter are all the same (Figure 39). The gap variation should not exceed 0.381 mm (0.015") around motor adapter.

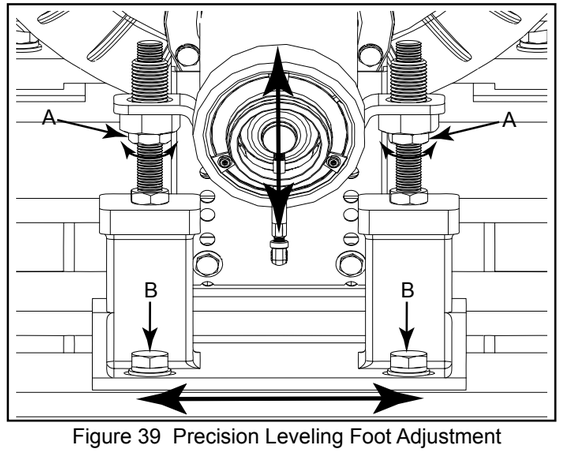

Figure 39 Precision Leveling Foot Adjustment

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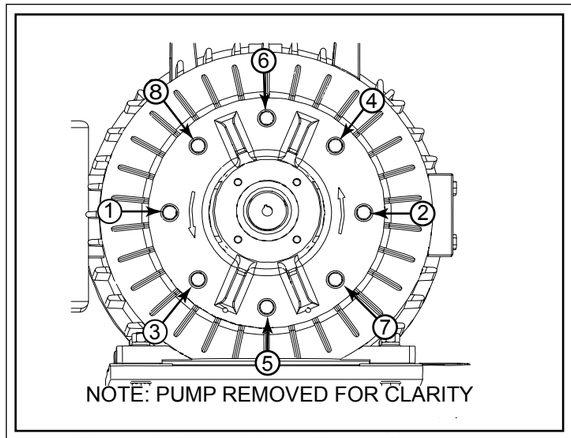

Figure 40 Motor Adapter Torque Sequence

Installation Procedures (cont.)

28. Install motor adapter bolts and washers and tighten to:
    3/8" bolts - 28 N-m (21 Lb-ft).
    1/2" bolts - 61 N-m (45 Lb-ft).

    NOTE: Tighten the motor adapter bolts in the sequence shown to minimize stress (Figure 40).

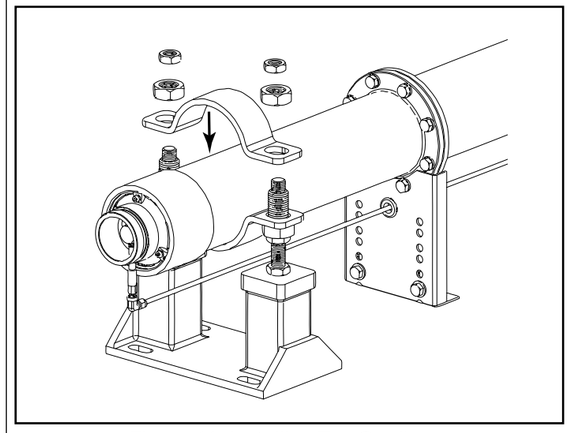

Figure 41 Installing Top Cradle

29. Install top cradle back to precision leveling foot (Figure 41). Tighten to 149 N-m (110 Lb-ft).

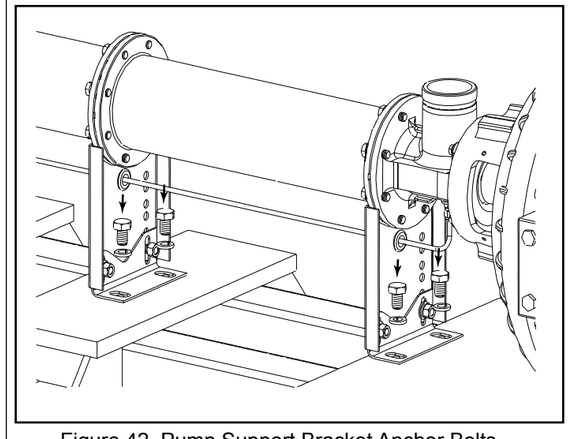

Figure 42 Pump Support Bracket Anchor Bolts

30. Install support bracket anchor bolts and washers (Figure 42). Tighten to to specification for the size bolts used.

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Installation Procedures (cont.)

31. Adjust support bracket height and tighten adjustment bolts to 61 N-m (45 Lb-ft) (Figure 42).

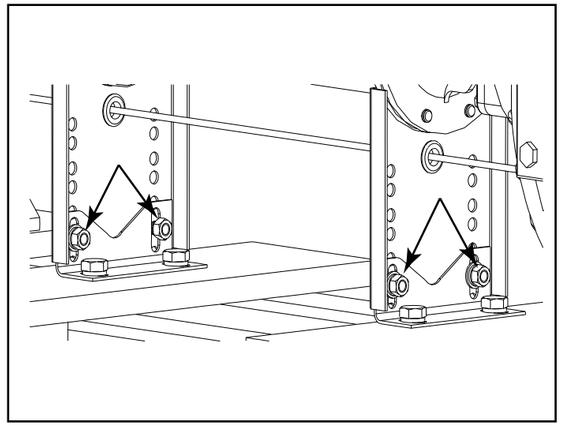

Figure 43 Pump Support Bracket Adjustment Bolts

32. Install coupling guards and tighten screws (Figure 43).

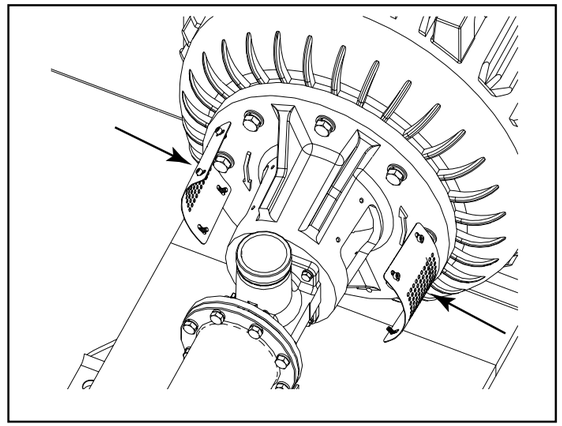

Figure 44 Coupling Guard Installation

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Installation Procedures (cont.)

Pump Piping Connections

Piping Alignment

- Accurate alignment and support of all piping connected to the pump is critical (Figure 45).
- Any movement occurring at the inlet or discharge pump connections may cause pump misalignment and stress over time.
- Do not force any misaligned pipes to connect to the pump discharge or inlet.

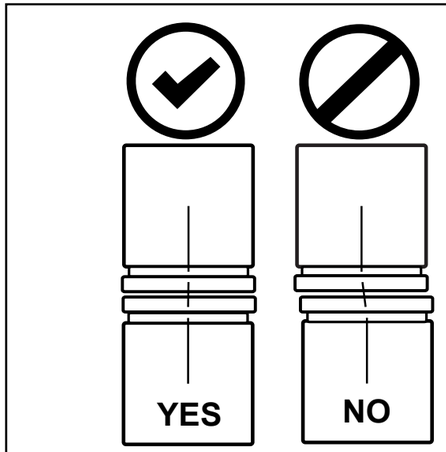

Figure 45 Proper Piping Alignment

Pipe Couplings

- Use only grooved type couplings at all pump and pipe connections (Figure 46).
- Follow all manufacturer installation and torque specifications.
- Align all piping carefully before installing couplings.
- DO NOT use couplings to force piping to align. Make sure all seals seat correctly inside the coupling.
- If piping or seals are not aligned correctly, leaking may occur under pressure.

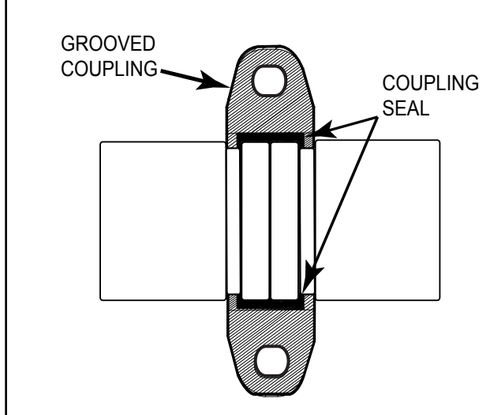

Figure 46 Typical Grooved Coupling

Inlet Piping

Keep the inlet pipe free of high points which could trap air and could disrupt pump priming. Vacuum and/or pressure gages are recommended to allow measurement of pump inlet pressure. NEVER throttle the pump on the inlet side.

Outlet Piping

The pump discharge piping should have a removable section of pipe such as a spool piece or elbow to allow the pump to slide forward for service (Figure 47). Servicing the shaft seal, water bearing or flexible coupling requires a space of approximately 30.5 cm (12 inches) minimum. The pump assembly must be free to move away from the motor in order to gain access to these components.

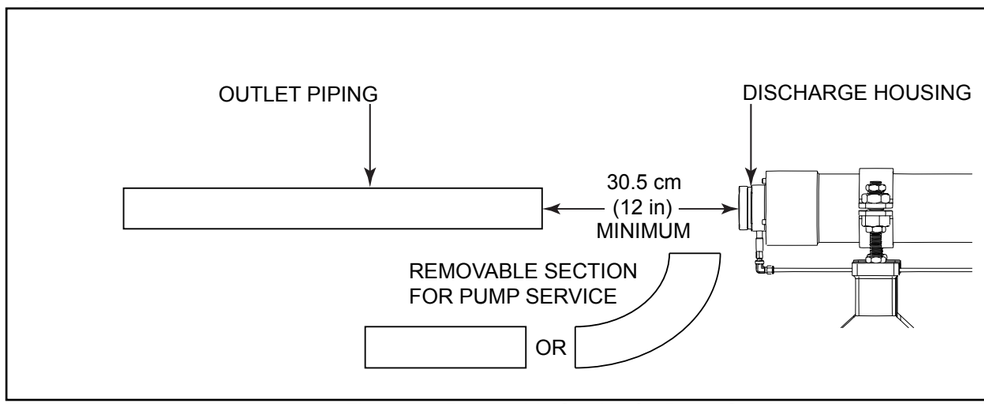

Figure 47 Removable Section for Pump Service

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Installation Procedures (cont.)

Recommended Instrumentation and Operation

For safe pump operation, a pressure switch or relief valve is recommended for the high pressure side (before the membranes). Pressure gauges should be installed at the inlet and outlet of the MSS pump (Figure 48). If a throttle valve is used, an additional gauge is needed on the output side of the valve. It is recommended that a pressure switch should be installed at the pump inlet to prevent pump operation if the feed pressure to the pump is below specifications. MSS pumps are not equipped with a check valve to prevent back flow. Refer to the pump yellow tag and pump nameplate for equipment specifications (Figure 49).

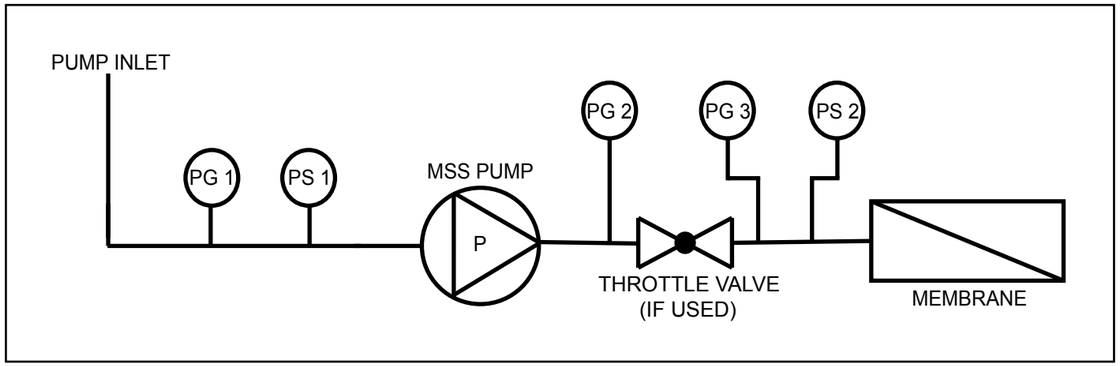
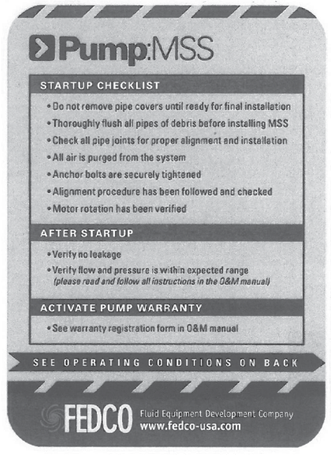
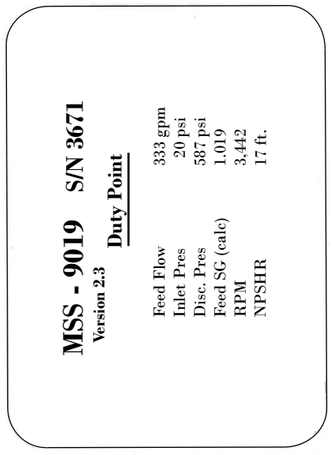


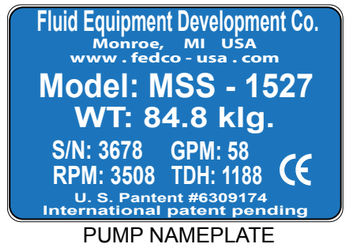
Figure 48 Recommended Instrumentation


Pump:MSS
STARTUP CHECKLIST
•Do not remove pipe covers until ready for final installation
•Thoroughly flush all pipes of debris before installing MSS
•Check all pipe joints for proper alignment and installation
•All air is purged from the system
•Anchor bolts are securely tightened
•Alignment procedure has been followed and checked
•Motor rotation has been verified
AFTER STARTUP
•Verify no leakage
•Verify flow and pressure is within expected range
(please read and follow all instructions in the O&M manual)
ACTIVATE PUMP WARRANTY
•See warranty registration form in O&M manual
SEE OPERATING CONDITIONS ON BACK
FEDCO Fluid Equipment Development Company
www.fedco-usa.com

YELLOW TAG FRONT



YELLOW TAG REAR


Fluid Equipment Development Co.
Monroe, MI USA
www . fedco - usa . com
Model: MSS - 1527
WT: 84.8 klg.
S/N: 3678 GPM: 58
RPM: 3508 TDH: 1188
U. S. Pantent #6309174
International patent pending

PUMP NAMEPLATE

Figure 49 Pump Operating Specifications

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Upstream Filtration

- The pump must be protected from debris in the feed water such as sand, gravel, or other particulate matter.
- A 20 micron filter must be installed upstream of the pump inlet to protect against foreign matter entering the system.
- Temporary strainers should be installed after initial start up or repairs to protect the pump from possible debris.

Preparation for Pump Start Up

Start Up Precautions

WARNING

NEVER operate the pump equipment:
- below the minimum flow rate.
- when dry.
- without priming.
- without proper guards and safety devices installed.
- with the discharge valve closed.
- with the suction valve closed.

ELECTRICAL HAZARD

Refer to the motor name plate, electrical junction box cover, or wiring tag for proper wiring. All electrical connections should be made by a licensed electrician according to all local codes and regulations. Be sure to follow all manufacturer's instructions on motor lubrication. Ensure motor rotational direction is correct according to the arrow located on the motor adapter (Refer to “Motor Rotational Direction Check”).

CAUTION

Electric motors may develop continual noise over long periods. Proper ear protection should be worn during pump operation. Most noise will emanate from the electric motor. The noise level of the MSS pump is nominal and depends on its size and operating conditions. The typical level can range from 75dB to 97dB, measured at a distance of 1 meter (39 inches) around the pump. Sound may vary due to hydraulic resonance, valves and building walls. For applications were a minimum noise level is required, the system should be operated with the flow adjusted as close to optimum efficiency as possible.

Start Up Check List

An additional Start Up Check List is available in the rear of this manual. Also use the Start Up Record at the rear of this manual to record initial operating conditions at pump start up.

- ☐ Flexible coupling set screws tightened.
- ☐ Motor adapter guards installed.
- ☐ All anchor bolts tightened to specifications.
- ☐ All pipe couplings tightened to specifications.
- ☐ Motor rotational direction correct.
- ☐ Motor lubricated to manufacturers specifications.
- ☐ Final Pump Alignment performed.
- ☐ Inlet pressure indicator installed.
- ☐ Inlet pressure switch (if applicable) installed.
- ☐ Outlet pressure indicator installed.
- ☐ System pipes are clean and upstream filtration in place.
- ☐ System leak checked and all air vented from system.
- ☐ ALL safety devices in place.

Pump Start Up

NOTE: Use the “Start Up Record” located in the rear of this manual to record initial operating conditions at pump start up.

1. Start low pressure booster pump and vent air from the system.
2. Verify that there are no leaks in the system.
3. Activate the MSS pump.
4. Inspect the system for leaks.

NOTE: Some mechanical shaft seal leakage may occur for about 60 seconds after pump start-up. If the leakage continues longer than 60 seconds then proceed with the mechanical shaft seal replacement procedure.

5. Observe any unusual system noise or vibration.
6. If a vibration meter is available, record a baseline vibration reading at this time.
7. Adjust system valves and controls as needed to obtain the desired operating condition.

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Basic Troubleshooting

If the MSS pump does not operate properly, refer to the following troubleshooting charts as a guide to determining the concern and identifying the potential cause. If after consulting the troubleshooting charts the cause is still undefined, contact FEDCO technical support by e-mail (techsupport@fedco-usa.com), telephone or FAX. FEDCO will give you easy, step by step instructions on how to proceed.

Visual Inspection

- Make sure all items are accounted for on the start up check list.
- Inspect all piping and electrical connections to the motor and pump.
- Inspect the pump and motor mountings for signs of any movement or vibration.
- Inspect pressure gauges, switches and all other instrumentation for proper operation.
- Record any unusual readings.

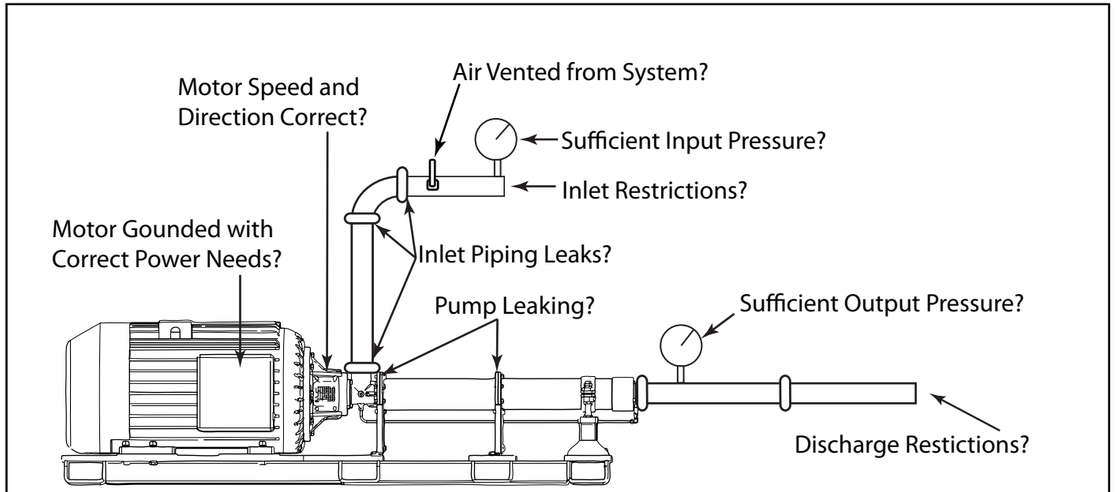

Figure 50 Basic Visual Inspection

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BASIC TROUBLESHOOTING

Symptom	Possible Cause	Action
Low flow or low pressure	Restriction in inlet or discharge pipes	- Check pump inlet pressure - Check position of all control valves - Check throttle valve is fully open
	Incorrect pump speed or direction	- Check VFD for proper speed setting (if equipped). - Check power supply frequency (50 or 60 Hz) - Check rotational direction of motor
	Gauges not operating properly	- Inspect gauges for proper operation.
	Air Leaks (vacuum on pump inlet)	- Inspect inlet piping joints for leaks - Inspect pump mechanical shaft seal for leaks
	Pump cavitation	- Check inlet pressure during operation - Check for excessive flow rate
	Air in casing	- Purge air from all piping
	Internal damage	- Damaged balance disc
	Design parameters	- Pump not designed for operating conditions
Pump vibration or noise	Operating conditions	- Pump Cavitation - Excessive flow rate - Insufficient flow rate
	Pump misalignment	- Inspect Alignment (Refer to “Final Pump Alignment”)
	Balance disc	- Inspect balance disc for damage or wear
Pump Leaks	Pipe Joints	- Inspect pipe joints for insufficient sealing
	Pump Shell	- Inspect pump shell for damaged O-rings
	Pump Shaft	- Inspect mechanical seal for leakage - Inspect pump shaft for misalignment
Motor runs hot, is noisy or shuts off	Excessive Motor Load	- Check voltage supply for consistency - Check ambient air temperature - Check wiring and fuses for phase loss - Check flow rate and VFD settings (if equipped). - Check wiring length between motor and VFD (if equipped). - Check motor bearings **NOTE:** Contact motor manufacturer for proper repair procedures.

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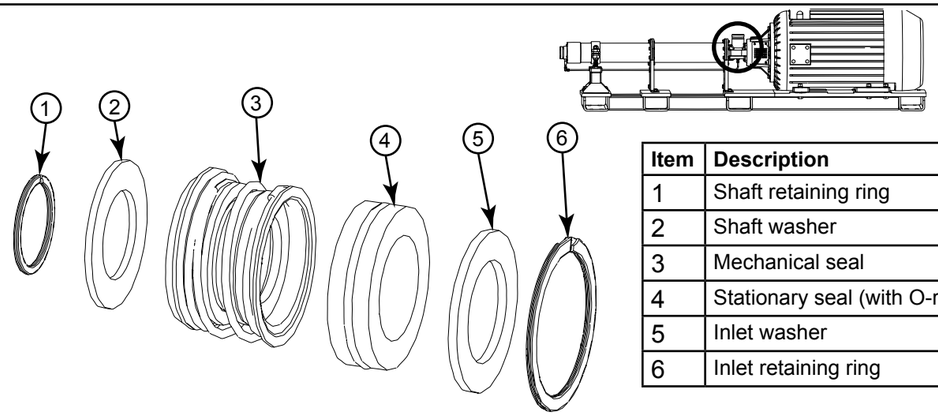
Standard Shaft Seal Replacement



Item	Description
1	Shaft retaining ring
2	Shaft washer
3	Mechanical seal
4	Stationary seal (with O-ring)
5	Inlet washer
6	Inlet retaining ring

Figure 51 Shaft Seal Components

Shaft Seal—Standard

ELECTRICAL HAZARD

Make sure to disconnect the power supply to the motor before carrying out component replacement procedures. Follow all Lock out/Tag out procedures developed by your company before starting any maintenance or repair.

Removal

1. Drain the piping and pump.
2. Disconnect inlet and outlet piping.
3. Loosen eight (8) screws and remove coupling guards (Figure 52).

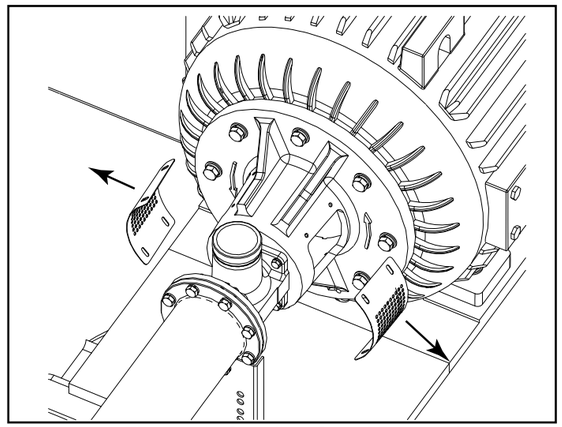


Figure 52 Coupling Guard Removal

4. Remove anchor bolts and washers from shell support bracket(s) (Figure 53).

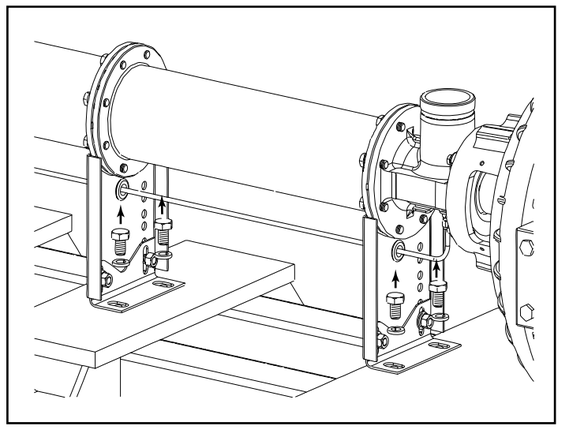


Figure 53 Support Bracket Anchor Bolt Removal

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Standard Shaft Seal Replacement (Cont.)

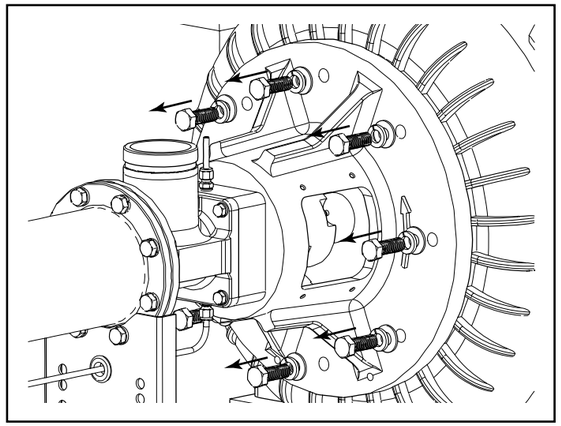

Figure 54 Motor Adapter Bolt Removal

5. Remove motor adapter bolts and washers (Figure 54).

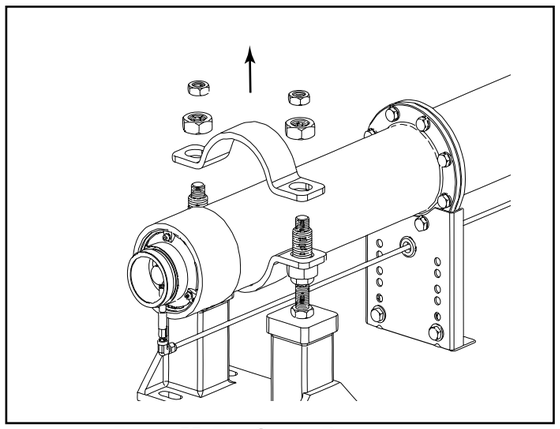

Figure 55 Top Cradle Removal

6. Remove the four (4) nuts and top cradle from precision leveling foot (Figure 55).

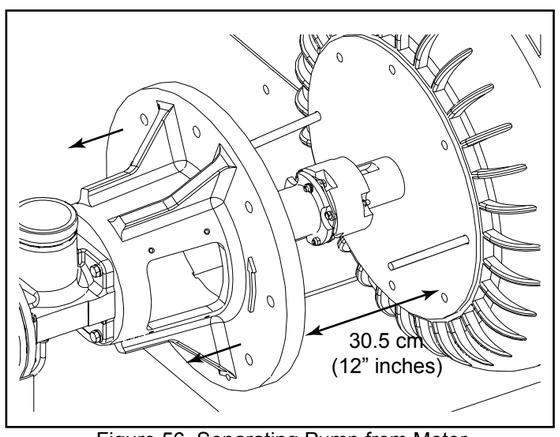

Figure 56 Separating Pump from Motor

7. Install alignment pins to prevent damage to mechanical seal and carefully slide pump 30.5 cm (12 inches) away from motor (Figure 56).

NOTE: Make sure to support inlet end of the pump

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Standard Shaft Seal Replacement (Cont.)

8. Remove four (4) inlet housing bolts and washers from Inlet Housing (Figure 57).

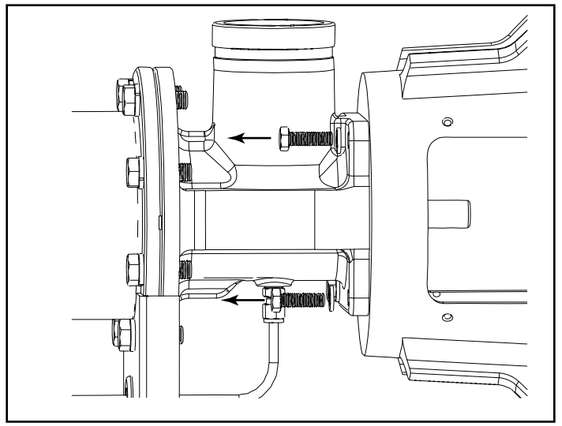

Figure 57 Removing Inlet Housing Bolts

9. Remove motor adapter and leakage bushing from inlet housing (Figure 58).

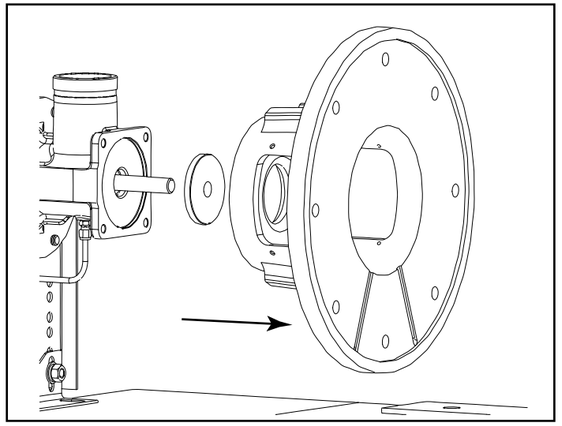

Figure 58 Removing Motor Adapter and Leakage Bushing

10. Remove inlet retaining ring from inlet housing (Figure 59).

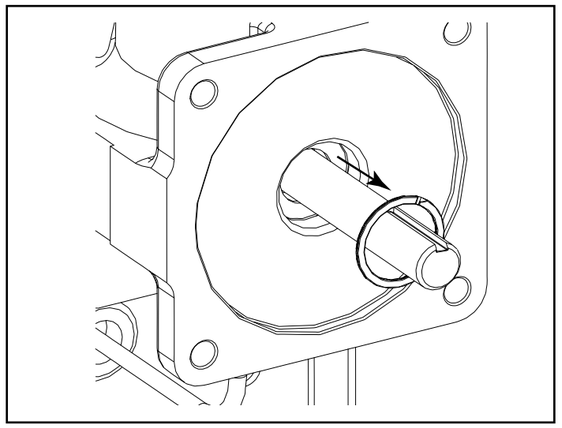

Figure 59 Removing Inlet Retaining Ring

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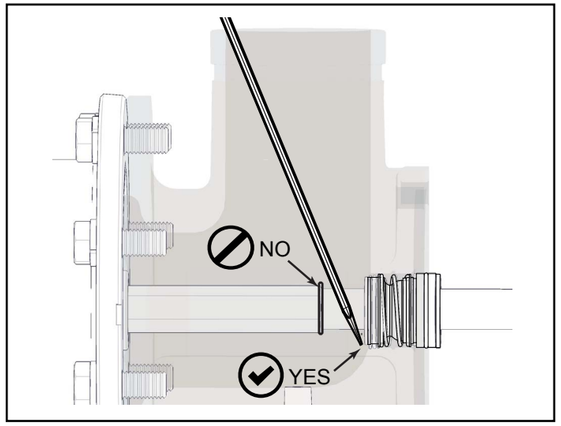

Figure 60 Removing Shaft Seal

Standard Shaft Seal Replacement (Cont.)

11. Apply soap and water to shaft and using a suitable tool through inlet housing fluid opening, gently push shaft washer, mechanical seal, stationary seal and inlet washer toward shaft end and remove (Figure 60).

    NOTE: Make sure to push the washer only. Do not push on the shaft retaining ring or damage may occur.

    NOTE: The shaft retaining ring does not need to be removed unless it is distorted or corroded and needs replacement.

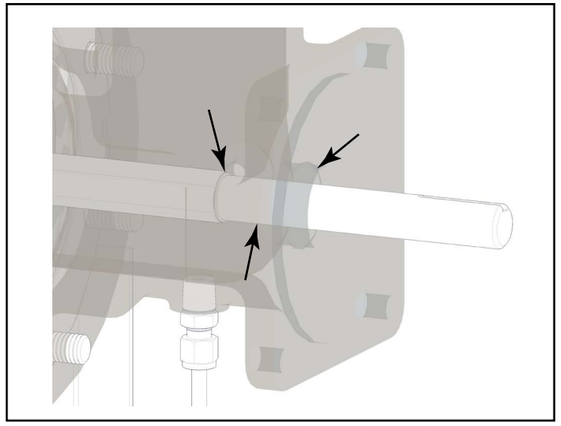

Figure 61 Inspecting Retaining Ring, Pump Shaft and Bore

12. Inspect pump shaft, shaft retaining ring and inlet seal bore and pump shaft for any damage (Figure 61). Remove any oil or dirt with a clean cloth.

Installation

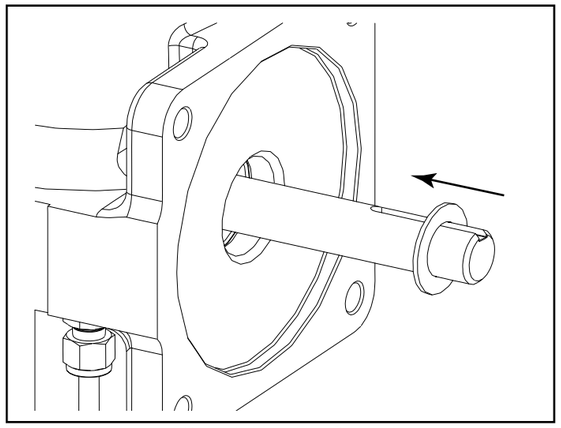

Figure 62 Installing Shaft Washer

1. Install new shaft washer onto pump shaft and slide against shaft retaining ring (Figure 62).

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Standard Shaft Seal Replacement (Cont.)

2. Slide new mechanical shaft seal followed by new stationary seal and inlet washer onto shaft (Figure 63).

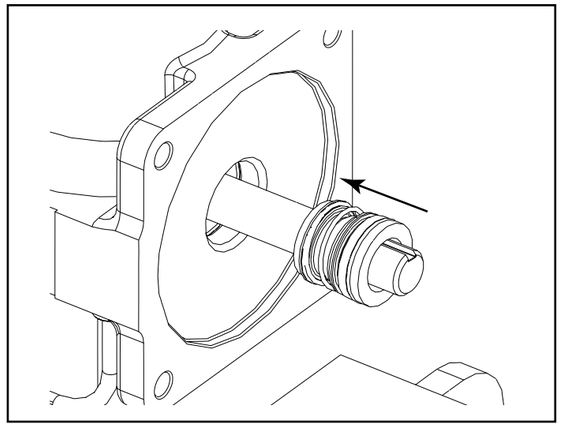

Figure 63 Installing Mechanical and Stationary Seals

3. Press in on inlet washer and Install inlet retaining ring into groove in inlet housing (Figure 64).

   NOTE: Make sure inlet retaining ring is completely seated in inlet housing groove.

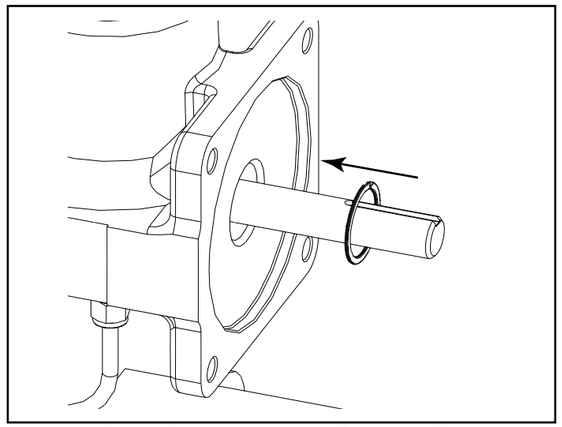

Figure 64 Installing Inlet Retaining Ring

4. Install leakage bushing in motor adapter seat (Figure 65).

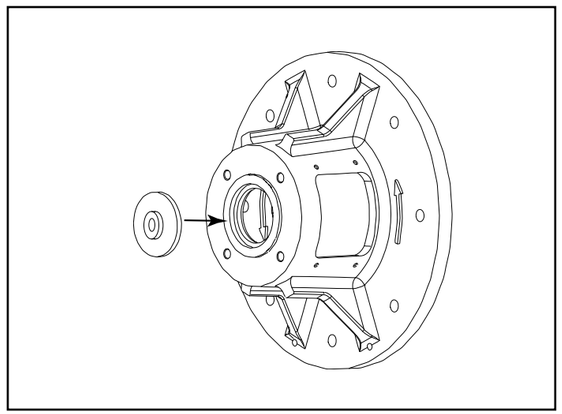

Figure 65 Installing Leakage Bushing

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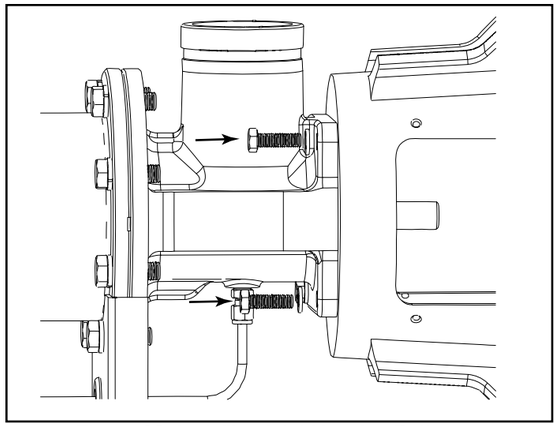

Figure 66 Installing Inlet Housing Bolts

Standard Shaft Seal Replacement (Cont.)

5. Secure inlet housing to motor adapter with four (4) inlet housing bolts with lock washers (Figure 66). Tighten to 28 N-m (21 Lb-ft) .

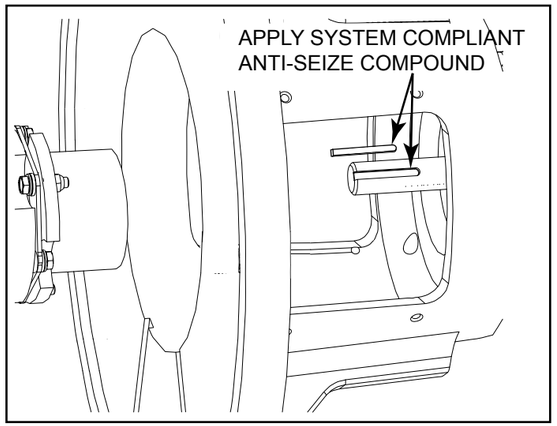

Figure 67 Installing Pump Shaft Key

6. Apply system compliant anti-seize compound on pump shaft and install pump shaft key (Figure 67).

   NOTE: Key should fit securely with rounded end facing toward the pump.

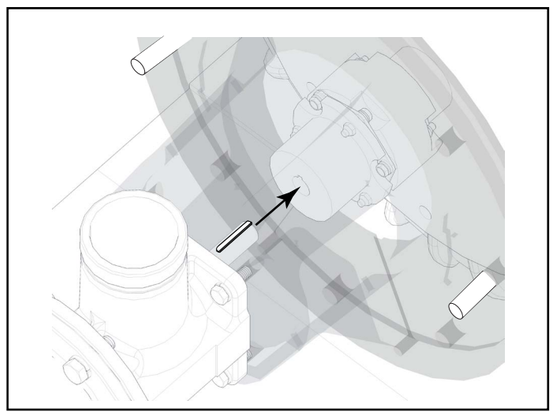

Figure 68 Attaching Pump to Motor

7. Carefully slide pump against motor making sure the pump shaft key slides smoothly into the flexible coupling. Push pump by hand until motor adapter and motor are in contact (Figure 68).

   NOTE: Make sure pump shaft does not jam or fall out during installation.

8. Refer to “Final Pump Alignment” earlier in this manual

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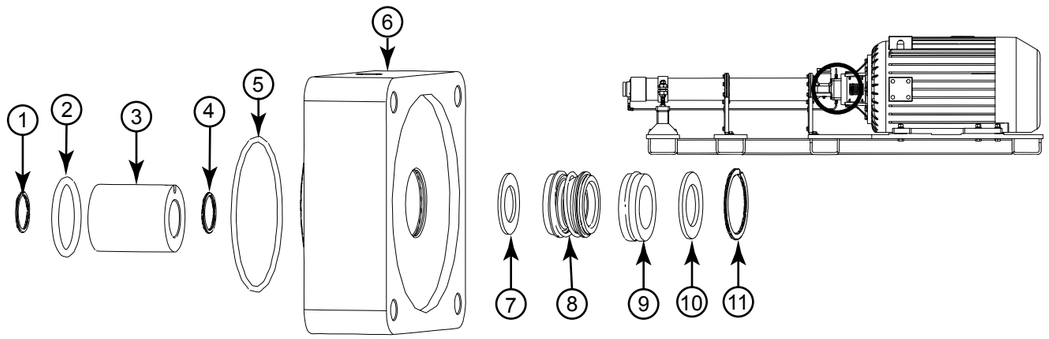
Optional High Inlet Pressure Seal Replacement



Item	Description	Item	Description
1	Graphite shaft sleeve retaining ring	7	Shaft washer
2	Graphite shaft sleeve O-ring	8	Mechanical seal
3	Graphite shaft sleeve	9	Stationary seal
4	Shaft retaining ring	10	Inlet washer
5	High pressure seal carrier O-ring	11	Inlet retaining ring
6	High pressure seal carrier		

Figure 69 High Pressure Seal Carrier Components

Shaft Seal—Optional High Inlet Pressure Design

ELECTRICAL HAZARD

Make sure to disconnect the power supply to the motor before carrying out component replacement procedures. Follow all Lock out/Tag out procedures developed by your company before starting any maintenance or repair.

Removal

1. Perform Steps 1 through 7 in “Shaft Seal-Standard” removal procedure.

2. Disconnect drain line(s) from high pressure seal carrier (Figure 70).

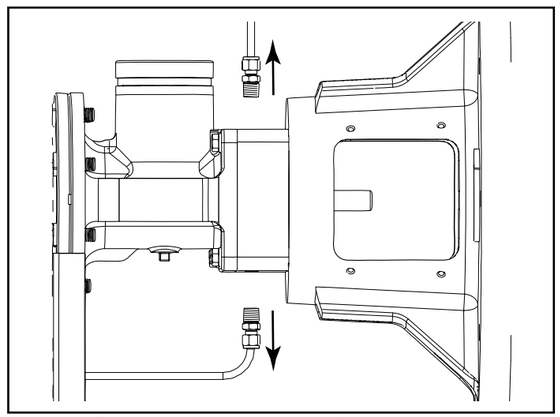


Figure 70 Disconnecting Drain Lines

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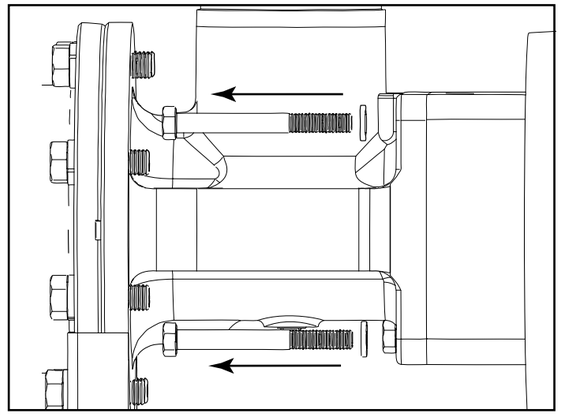

Figure 71 Removing Inlet Housing Bolts

Optional High Inlet Pressure Seal Replacement (Cont.)

3. Remove four (4) bolts and lock washers from inlet housing (Figure 71).

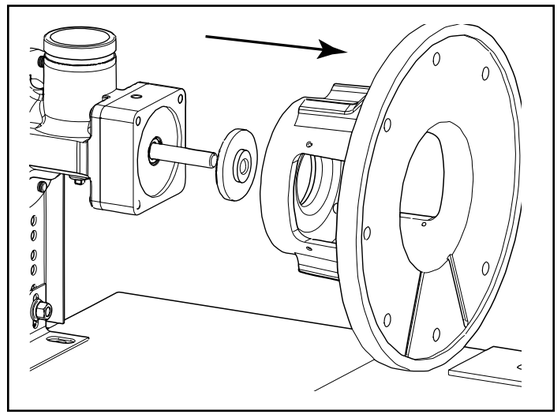

Figure 72 Removing Motor Adapter and Leakage Bushing

4. Remove motor adapter and leakage bushing from inlet housing (Figure 72).

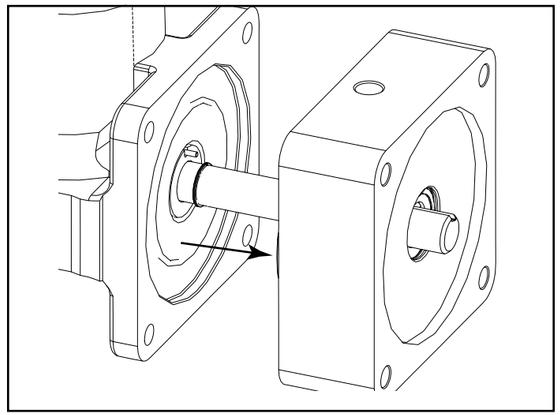

Figure 73 Removing High Pressure Seal Carrier

5. Remove high pressure seal carrier (Figure 73).

NOTE: All seal components will slide out with the carrier.

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Optional High Inlet Pressure Seal Replacement (Cont.)

6. Remove Inlet retaining ring, inlet washer, stationary seal, mechanical seal and shaft washer carrier (Figure 74).

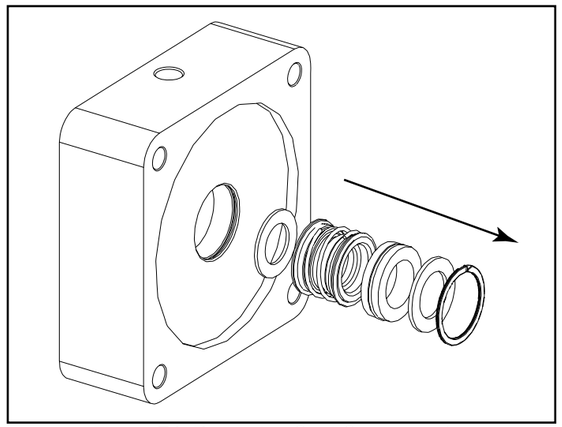

Figure 74 Removing Seal Components

7. Remove high pressure seal carrier O-ring (Figure 75).

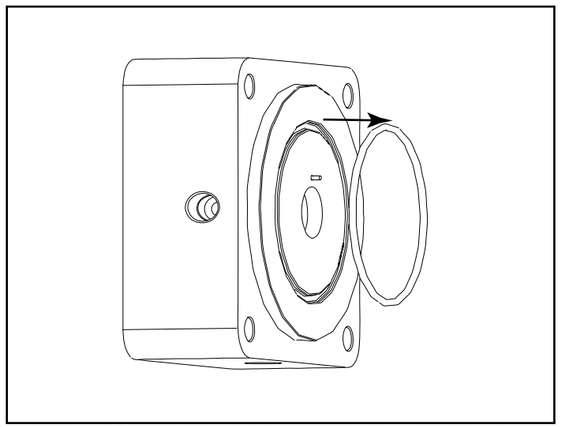

Figure 75 Removing High Pressure Seal Carrier O-Ring

8. Remove shaft retaining ring, graphite shaft sleeve and O-ring (Figure 76).

NOTE: If retaining ring appears weak or distorted, replace it.

NOTE: The graphite shaft sleeve retaining ring does not need to be removed unless it is distorted or corroded and needs replacement.

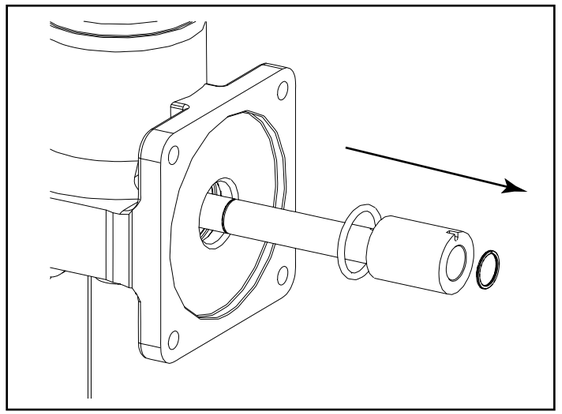

Figure 76 Removing Graphite Sleeve Components

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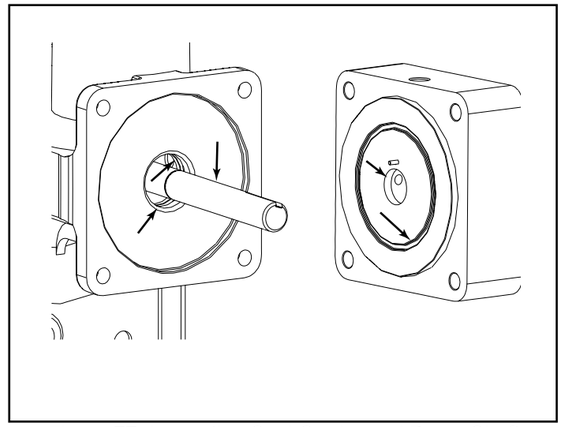

Figure 77 Inspecting Seal Carrier and Pump Shaft

Optional High Inlet Pressure Seal Replacement (Cont.)

12. Inspect high pressure seal carrier and inlet housing seal bores and shaft area for damage (Figure 77). Remove any oil of dirt with a clean cloth.

Installation

1. Lubricate and install a new O-ring with the graphite shaft sleeve and shaft retaining ring (Figure 78).

NOTE: Make sure the anti-rotation pin slot on the top of shaft.

NOTE: Make sure retaining ring is completely seated in shaft groove.

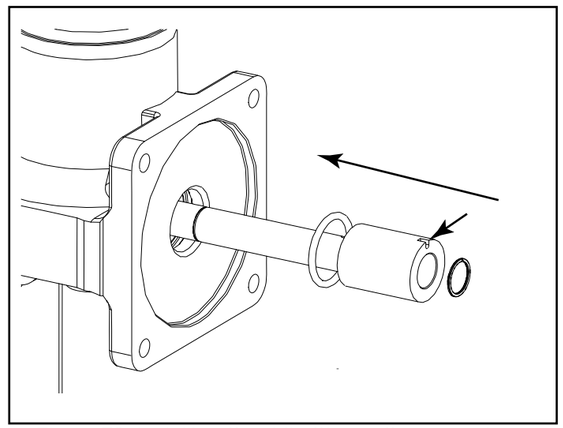

Figure 78 Installing Graphite Sleeve Components

2. Install new high pressure seal carrier O-ring (Figure 79).

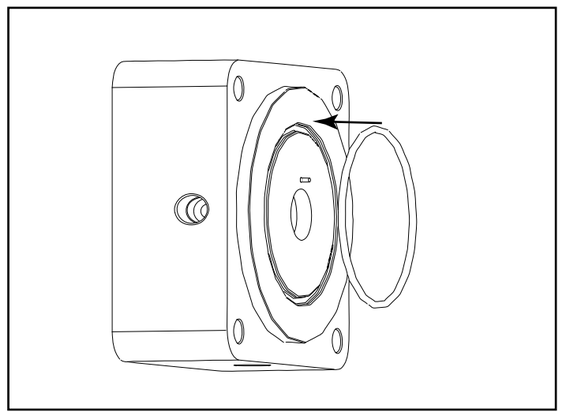

Figure 79 Installing New High Pressure Seal Carrier O-ring

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Optional High Inlet Pressure Seal Replacement (Cont.)

3. Install shaft washer, new mechanical seal, new stationary seal, inlet washer and secure with retaining ring (Figure 80).

   NOTE: Make sure retaining ring is completely seated in housing groove.

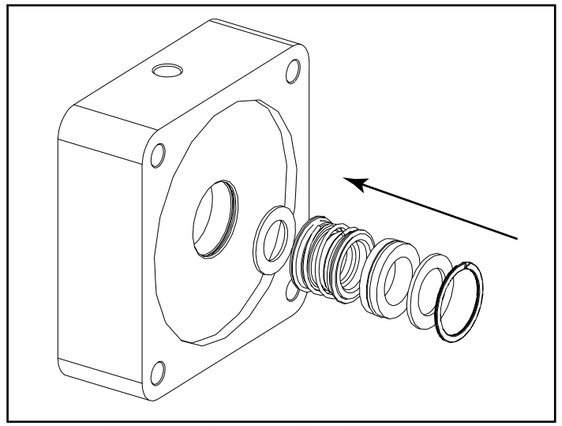

Figure 80 Installing Seal Components

4. Position high pressure seal carrier against inlet housing (Figure 81).

   NOTE: Make sure graphite shaft sleeve lines up with anti-rotation pin in high pressure seal carrier.

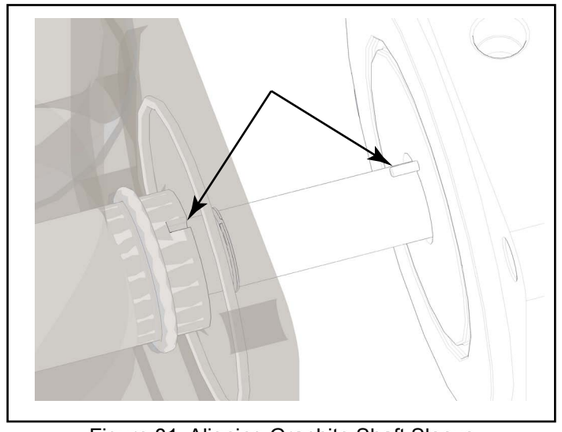

Figure 81 Aligning Graphite Shaft Sleeve

5. Install leakage busing into motor adapter seat (Figure 82).

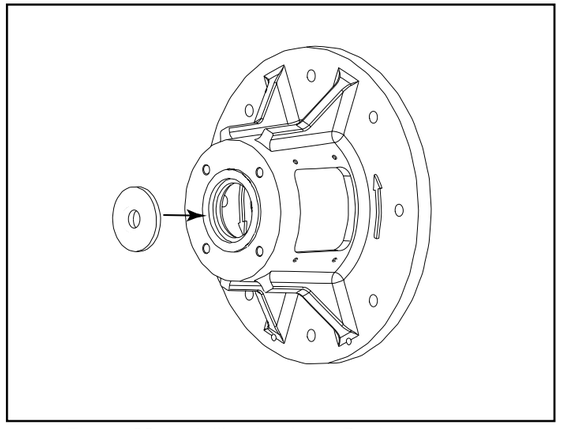

Figure 82 Installing Leakage Bushing

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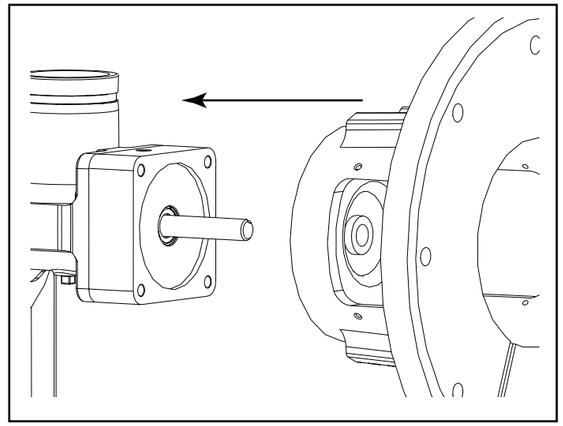

Figure 83 Installing Motor Adapter

Optional High Inlet Pressure Seal Replacement (Cont.)

6. Install motor adapter (Figure 83).

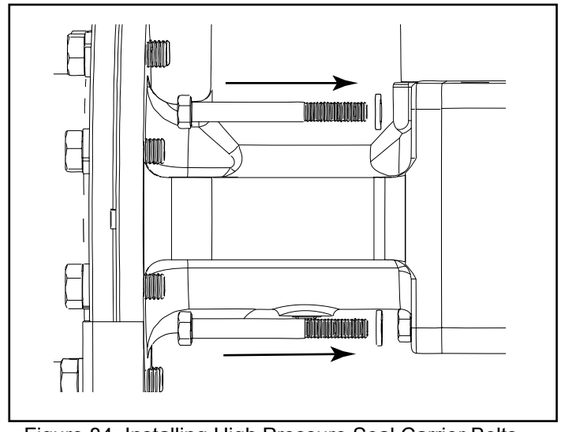

Figure 84 Installing High Pressure Seal Carrier Bolts

7. Secure motor adapter to high pressure seal carrier with four (4) bolts and lock washers (Figure 84). Tighten to 28 N-m (21 Lb-ft).

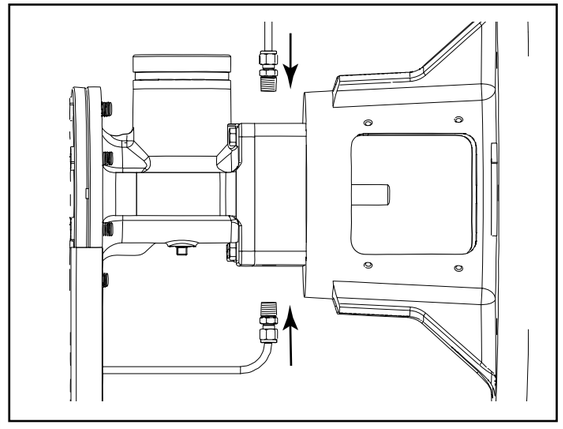

Figure 85 Installing Drain Lines

8. Connect drain lines to high pressure seal carrier (Figure 85).

9. Perform Steps 6, 7 and 8 in “Shaft Seal-Standard” installation procedure.

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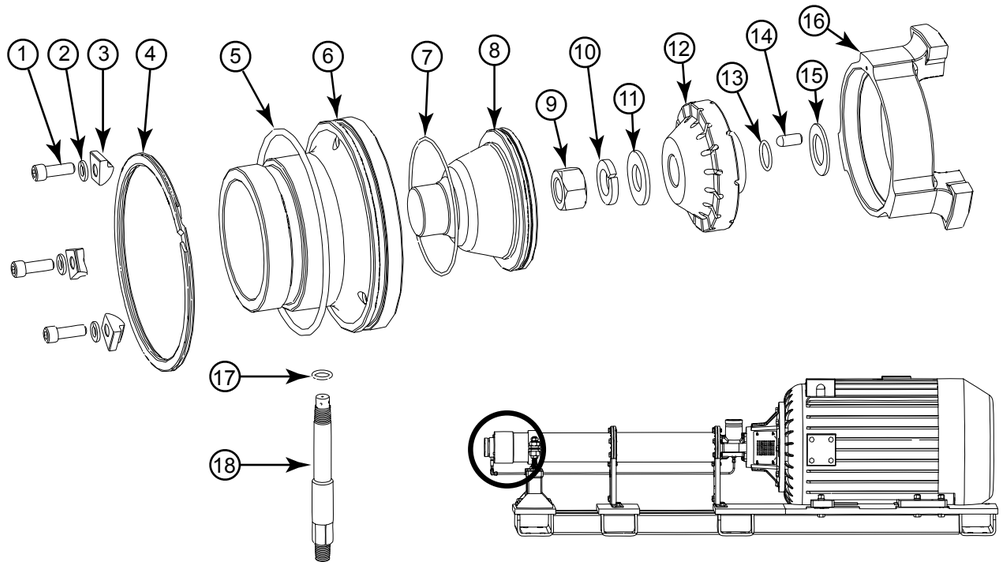
Balance Disc Replacement



Item	Description	Item	Description
1	Cap screw	10	Lock washer
2	Lock washer	11	Washer
3	Retaining clip	12	Balance disc
4	Discharge housing retaining ring	13	Balance disc O-ring
5	Discharge housing O-ring	14	Balance disc key
6	Discharge housing	15	Balance disc washer
7	Cavity cover O-ring	16	Bearing carrier
8	cavity cover	17	Throttle nipple O-ring
9	Pump shaft nut	18	Throttle nipple

Figure 86 Balance Disc Components

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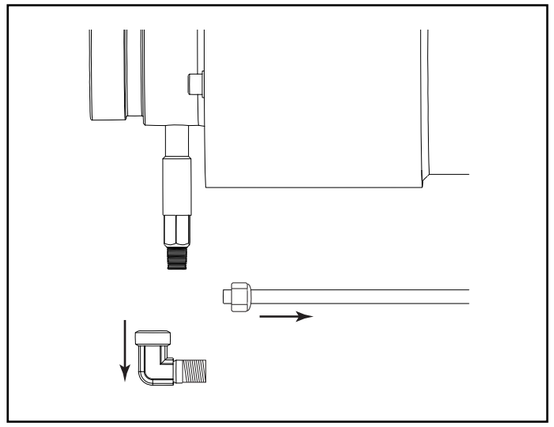

Figure 87 Disconnecting Drain Line

Balance Disc Replacement (cont.)

Balance Disc

ELECTRICAL HAZARD

Make sure to disconnect the power supply to the motor before carrying out component replacement procedures. Follow all Lock out/Tag out procedures developed by your company before starting any maintenance or repair.

Removal

1. Drain the piping and pump.
2. Disconnect outlet piping.
3. Disconnect bearing drain line from throttle nipple (Figure 87).

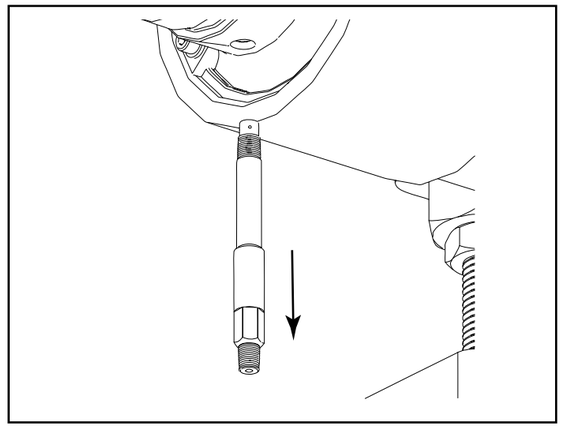

Figure 88 Removing Throttle Nipple

4. Remove throttle nipple from discharge housing (Figure 88).

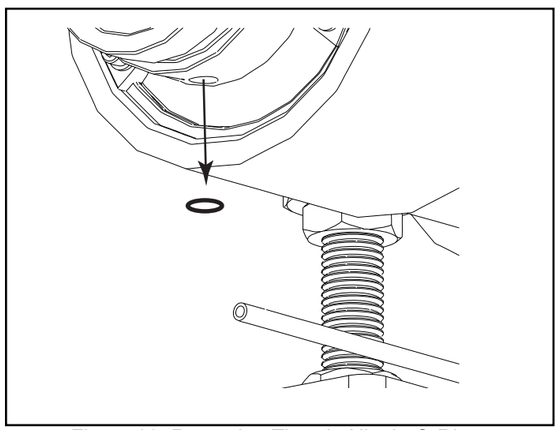

Figure 89 Removing Throttle Nipple O-Ring

5. Remove throttle nipple O-ring from discharge housing (Figure 89).

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Balance Disc Replacement (cont.)

6. Remove three (3) cap screws, lock washers and retention clips from discharge housing (Figure 90).

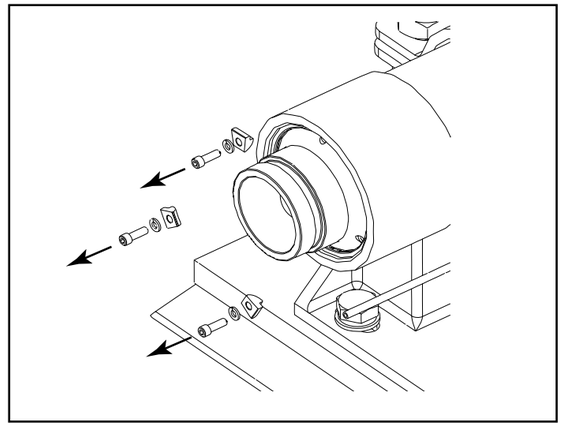

Figure 90 Removing Discharge Housing Cap Screws

7. Remove discharge housing retaining ring and discharge housing with O-ring (Figure 91).

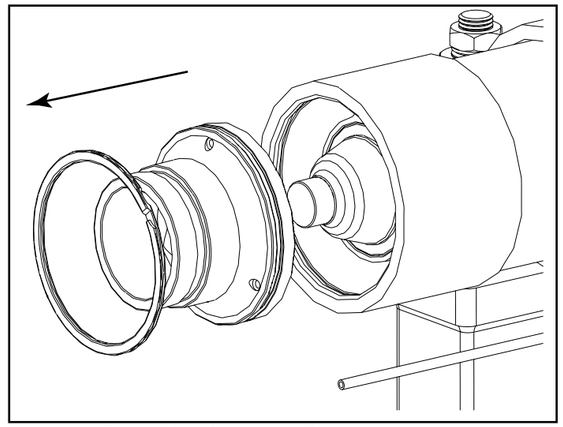

Figure 91 Removing Discharge Housing

8. Remove cavity cover with O-ring (Figure 92).

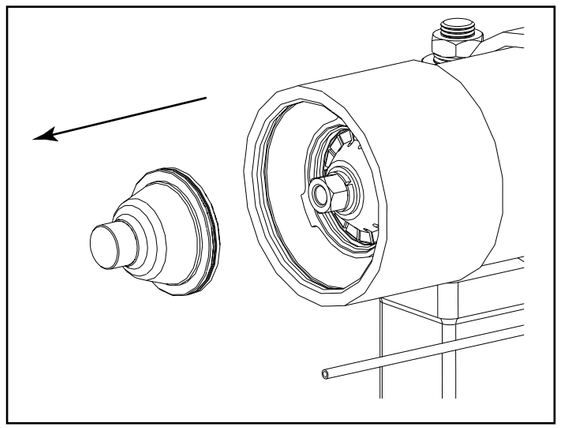

Figure 92 Removing Cavity Cover

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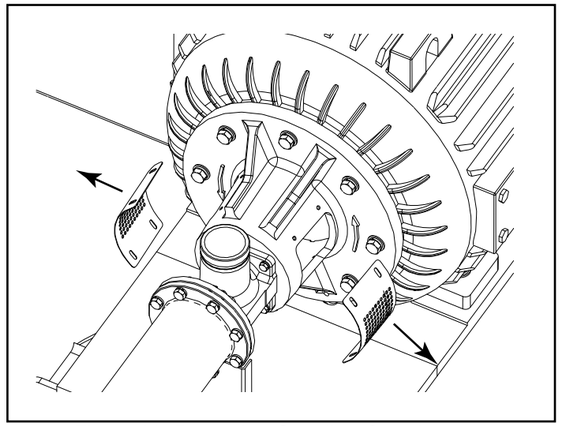

Figure 93 Removing Coupling Guards

Balance Disc Replacement (cont.)

9. Loosen eight (8) screws and remove coupling guards (Figure 93).

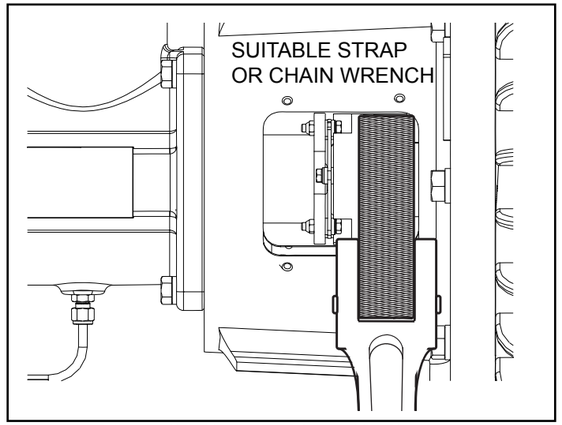

Figure 94 Securing Pump Shaft

10. Lock flexible coupling with a suitable strap or chain wrench to prevent pump shaft rotation (Figure 94).

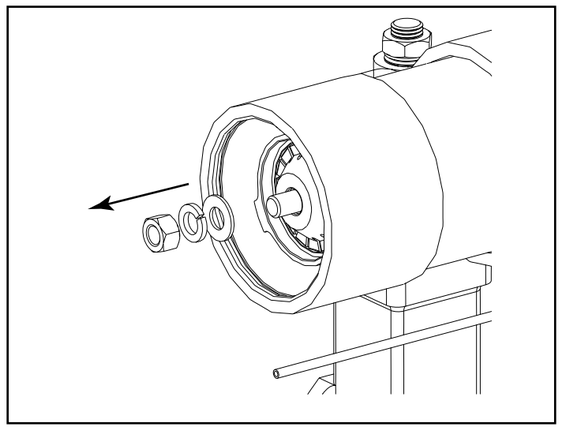

Figure 95 Removing Shaft Nut and Washers

11. Remove shaft nut, lock washer and washer (Figure 95).

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Balance Disc Replacement (cont.)

12. Remove bearing carrier with balance disc (Figure 96).

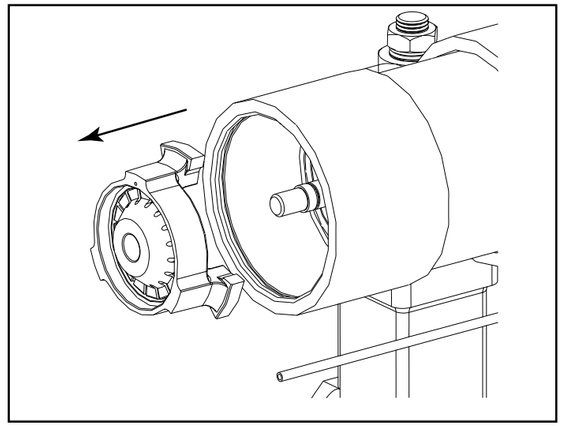

Figure 96 Removing Bearing Carrier and Balance Disc

13. Remove balance disc key, washer and O-ring (Figure 97).

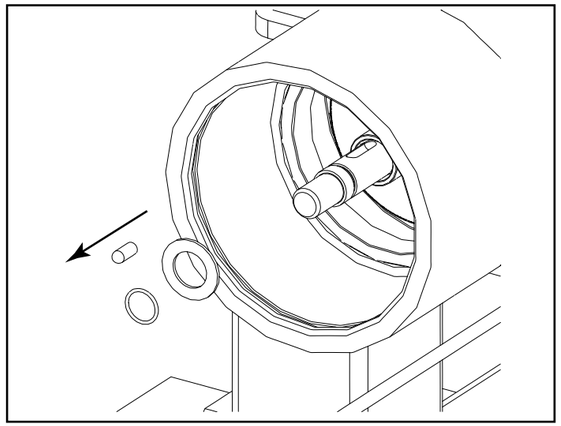

Figure 97 Removing Balance Disc Washer and Key

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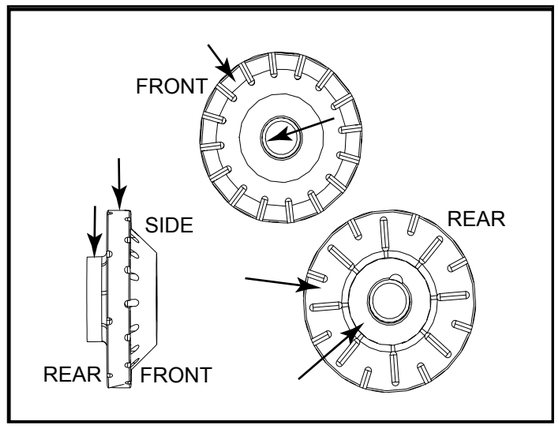

Figure 98 Inspecting Balance Disc

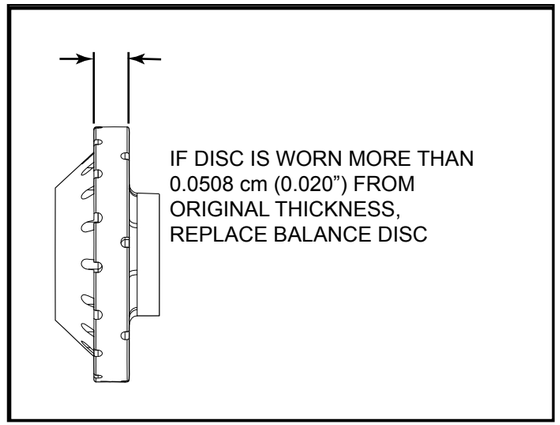

Figure 99 Measuring Balance Disc

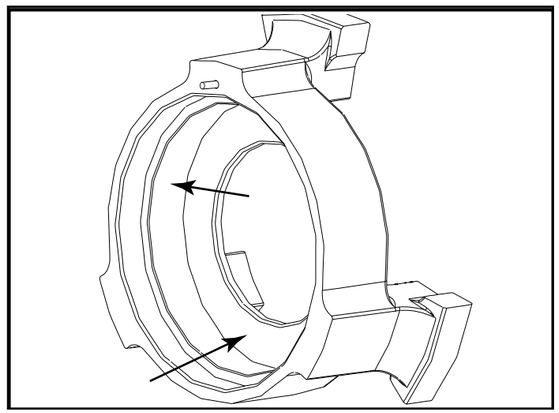

Figure 100 Inspecting Bearing Carrier

Balance Disc Replacement (cont.)

Balance Disc Inspection

1. Inspect surfaces of balance disc for unusual wear. Surface may have some wear but should be smooth (Figure 98).

2. Measure the balance disc outer hub thickness (Figure 99). Refer to the Balance Disc Wear Chart for wear limit specifications. The maximum acceptable balance disc wear is 0.508 mm (0.020”). If the balance disc wear exceeds its wear limit, it must be replaced.

Balance Disc Wear Chart

Balance Disc Model	Original Thickness When New	Wear Limit - 0.508 mm (0.020")
MSS-15 through MSS-75	13.5 mm (0.53”)	13.0 mm (0.51”)

3. Inspect the bearing carrier for unusual wear or scoring and replace if necessary (Figure 100).

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Balance Disc Replacement (cont.)

Installation

1. Carefully install bearing carrier into end shell (Figure 101).

   NOTE: Grasp pump shaft and lift so that bearing carrier is seated flush against diffuser housing. Make sure the discharge housing alignment pin is on top.

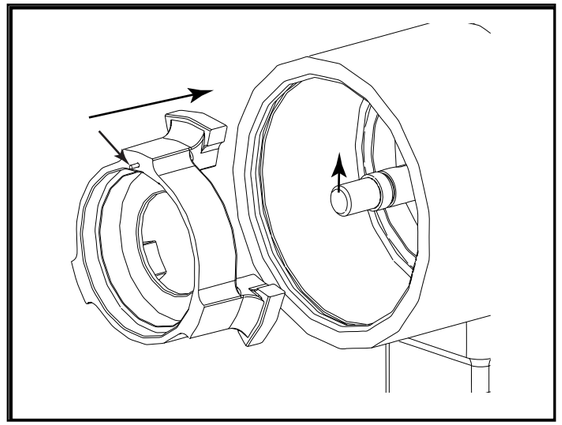

Figure 101 Installing Bearing Carrier

2. Apply system compliant anti-seize compound on pump shaft, lubricate a new balance disc O-ring and and install balance disc key, washer and O-ring (Figure 102).

   NOTE: Make sure the balance disc keyway is on top and the key is installed with the rounded end facing outward toward the discharge housing.

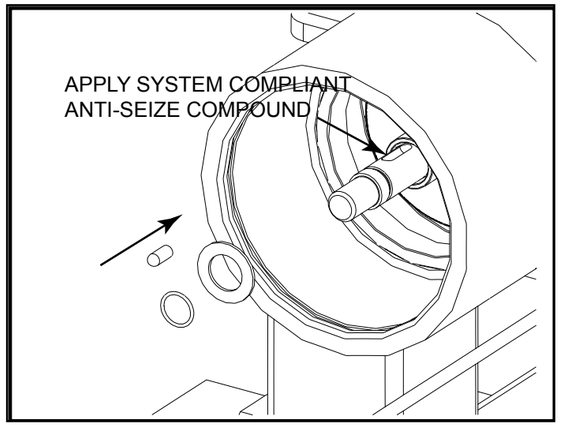

Figure 102 Installing Balance Disc Key, Washer and O-Ring

3. Install balance disc into bearing carrier (Figure 103).

   NOTE: Make sure balance disc is firmly seated in bearing carrier.

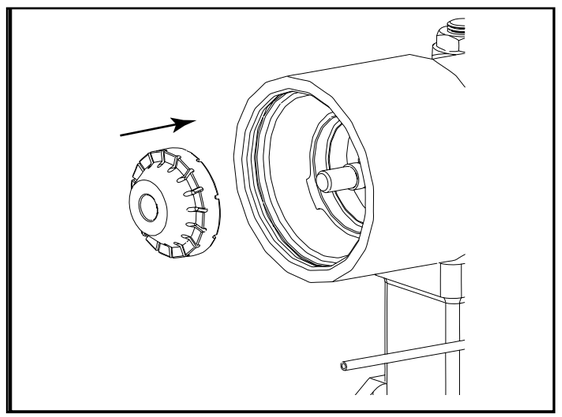

Figure 103 Installing Balance Disc

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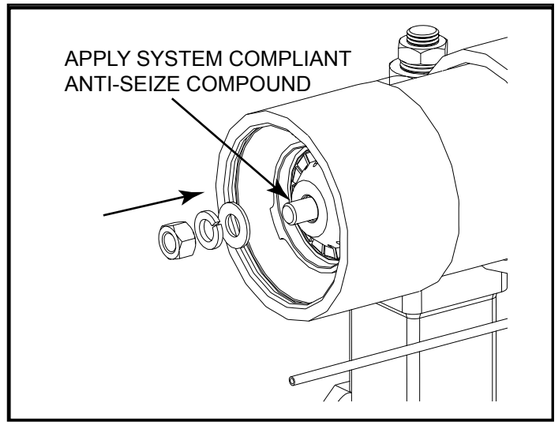

Figure 104 Installing Balance Disc Washers and Nut

Balance Disc Replacement (cont.)

4. Apply system compliant anti-seize compound on shaft threads and install balance disc washer, lock washer and shaft nut (Figure 104). Tighten to 68 N-m (50 Lb-ft.)

   NOTE: The pump shaft nut preload is critical to proper balance disc operation. A properly calibrated torque wrench must be used for this step.

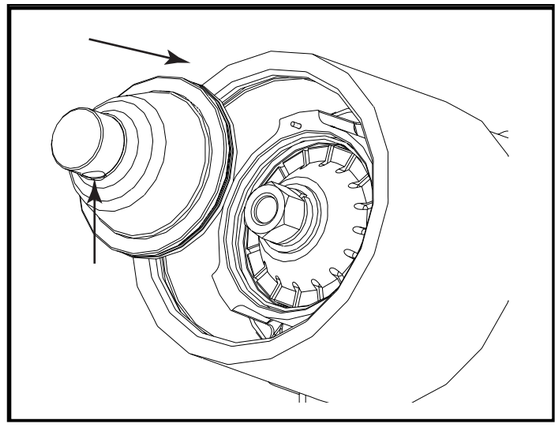

Figure 105 Installing Cavity Cover

5. Lubricate cavity cover O-ring and install cavity cover (Figure 105).

   NOTE: Make sure to align throttle nipple opening facing downward.

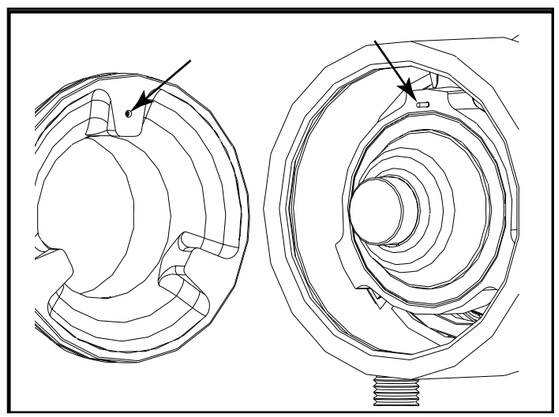

Figure 106 Discharge Housing Alignment Pin

6. Locate the discharge housing alignment pin in bearing carrier and note the discharge housing alignment cavity (Figure 106).

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Balance Disc Replacement (cont.)

7. Lubricate discharge housing O-ring and install discharge housing and retaining ring (Figure 107).

   NOTE: Make sure to align throttle nipple opening with throttle nipple opening in cavity cover.

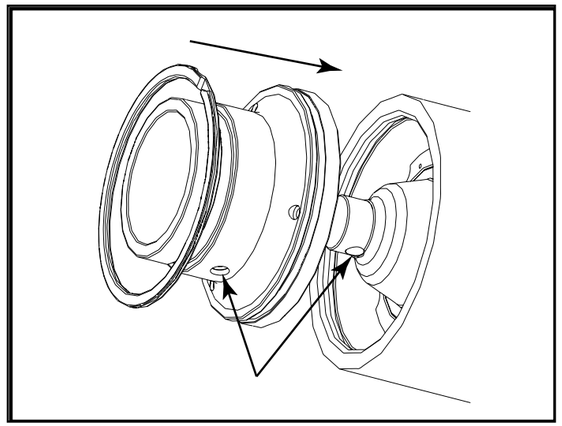

Figure 107 Installing Discharge Housing

8. Temporarily install throttle nipple to ensure cavity cover and discharge housing are properly aligned (Figure 108).

9. Remove throttle nipple.

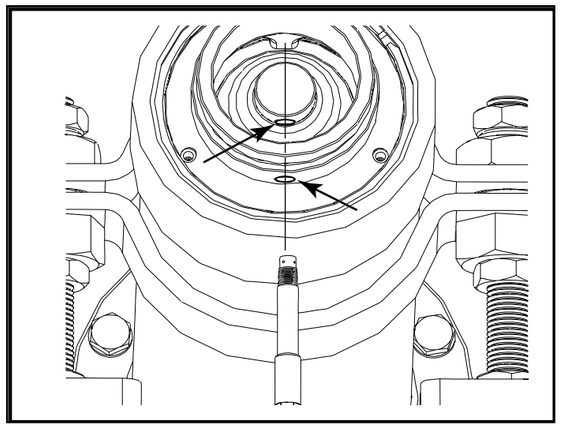

Figure 108 Inspecting Discharge Housing Alignment

10. Install retention clips lock washers and cap screws (Figure 109). Tighten to 4 N-m (35 Lb-in).

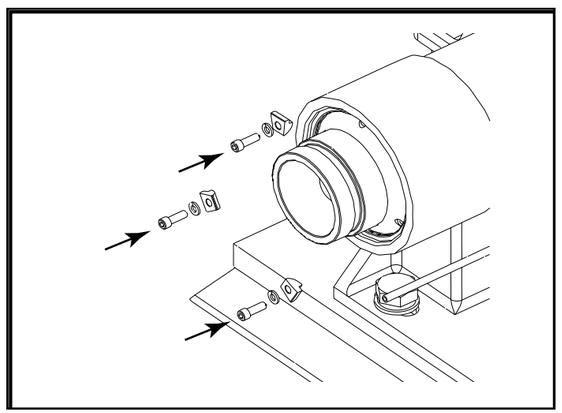

Figure 109 Installing Discharge Housing Retention Clips

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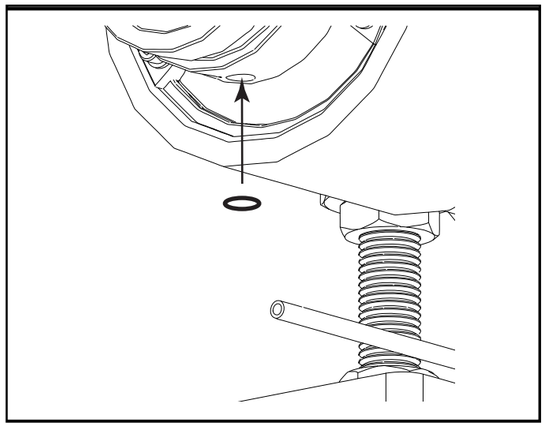

Figure 110 Installing Throttle Nipple O-Ring

Balance Disc Replacement (cont.)

11. Lubricate and install a new throttle nipple O-ring into the discharge housing (Figure 110).

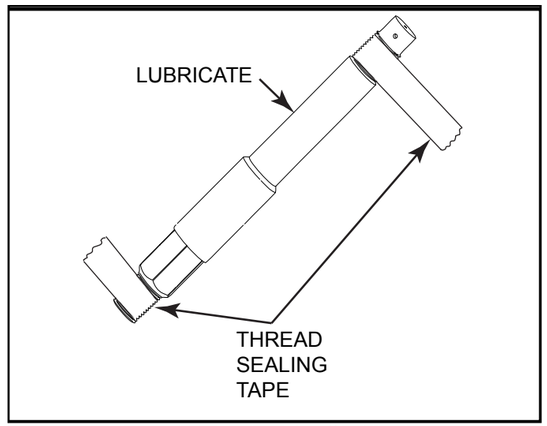

Figure 111 Taping Throttle Nipple

12. Apply thread sealing tape to throttle nipple threads and lubricate non-threaded portion of throttle nipple (Figure 111).

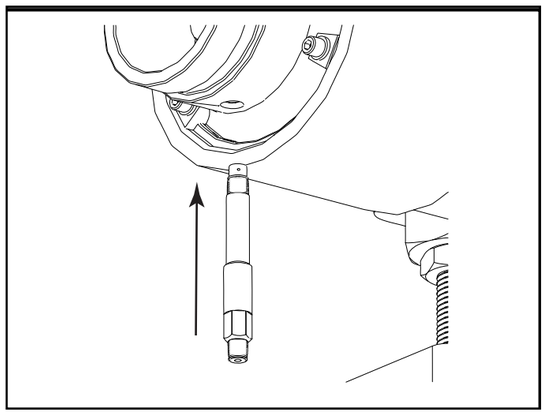

Figure 112 Installing Throttle Nipple

13. Thread throttle nipple through O-ring and into cavity cover (Figure 112).

    NOTE: Make sure to twist or thread throttle nipple through O-ring to prevent dislodging it.

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Balance Disc Replacement (cont.)

14. Reconnect bearing drain line to throttle nipple (Figure 113).

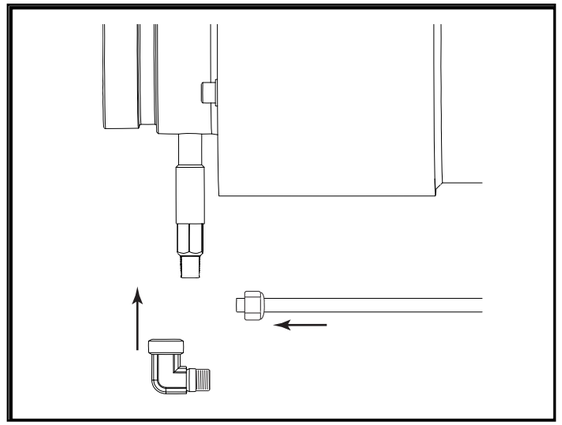

Figure 113 Connecting Drain Line

15. Remove strap or chain wrench and install coupling guards and tighten screws (Figure 114).

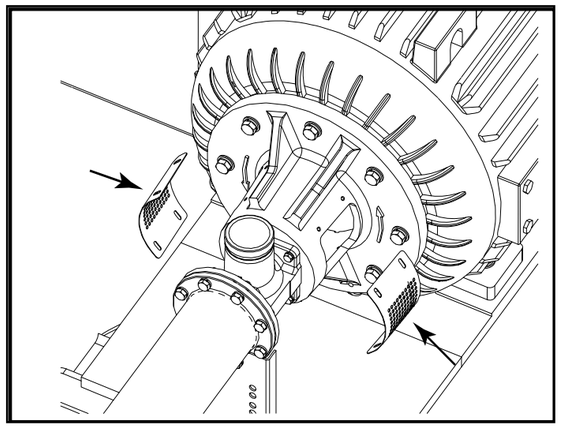

Figure 114 Installing Coupling Guards

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Specifications (cont.)

Components Exploded Views

External Components

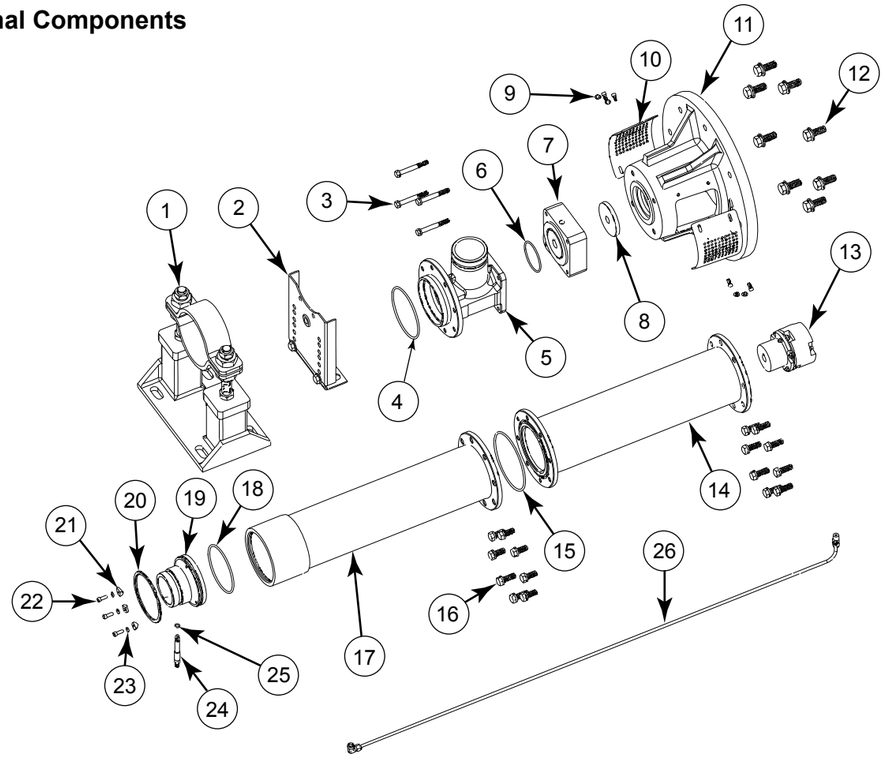

Figure 115 Pump Assembly External Components

Item	Description	Item	Description
1	Precision Leveling Foot	14	Series shell (if equipped)
2	Shell Support Bracket	15	Series shell O-ring
3	Inlet housing bolts	16	Shell flange bolts
4	Inlet housing O-ring	17	End shell
5	Inlet housing	18	Discharge housing O-ring
6	High pressure seal carrier O-ring (if equipped)	19	Discharge housing
7	High pressure seal carrier (if equipped)	20	Discharge housing retaining ring
8	Leakage Bushing	21	Retaining clips
9	Coupling guard screws (part of coupling guard)	22	Retaining clip cap screws
10	Coupling guard	23	Lock washer
11	Motor adapter	24	Throttle nipple
12	Motor adapter bolts	25	Throttle nipple O-ring
13	Flexible coupling	26	Bearing drain line

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Specifications (cont.)

Recommended Spare Parts List

1-3 years of service

A maintenance kit (P/N 8-M0015-MTK) and a retaining ring kit (P/N 8-M0015-RTK) should be kept on hand. The maintenance kit consists of a balance disk, mechanical seal and O-rings. The retaining ring kit consists of all retaining rings in the assembly.

4-5 years of service

A complete disassembly, cleaning and inspection of all pump components is recommended. An overhaul kit and stage kit should be made available before beginning this procedure. Refer to the "Service Parts Kits" chart below for specific pump models.

Service Parts Kits

Part Number	Description
8-M0015-ORK	O-Ring kit
8-M0015-BDK	Balance disc kit
8-M0015-MSK	Mechanical seal kit
8-M0015-TNK	Throttle nipple kit
8-M0015-RTK	Retaining ring kit
8-M0015-ALK	Alignment kit
8-M0015-MTK	Maintenance kit
8-M0015-STK	Stage kit (Model MSS-15)
8-M0020-STK	Stage kit (Model MSS-20)
8-M0030-STK	Stage kit (Model MSS-30)
8-M0040-STK	Stage kit (Model MSS-40)

Part Number	Description
8-M0050-STK	Stage kit (Model MSS-50)
8-M0055-STK	Stage kit (Model MSS-55)
8-M0070-STK	Stage kit (Model MSS-70)
8-M0075-STK	Stage kit (Model MSS-75)
8-M0015-OHK	Overhaul kit (Model MSS-15)
8-M0020-OHK	Overhaul kit (Model MSS-20)
8-M0030-OHK	Overhaul kit (Model MSS-30)
8-M0040-OHK	Overhaul kit (Model MSS-40)
8-M0050-OHK	Overhaul kit (Model MSS-50)
8-M0055-OHK	Overhaul kit (Model MSS-55)
8-M0070-OHK	Overhaul kit (Model MSS-70)
8-M0075-OHK	Overhaul kit (Model MSS-75)

Ordering Parts

To order a component or service kit, simply contact a FEDCO representative at:

ATTN: Field Service Department
FEDCO
800 Ternes Drive
Monroe, MI 48162
USA

Additional Contact Information:
Tel 734-241-3935
Fax 734-241-5173
E-mail : techsupport@fedco-usa.com
Web site: http://www.fedco-usa.com/service

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Specifications (cont.)

Fastener Torque Specifications

Item	Metric	Standard
Precision leveling foot top cradle nuts	149 N-m	110 Lb-ft
Motor adapter bolts - 3/8"	28 N-m	21 Lb-ft
Motor adapter bolts - 1/2"	61 N-m	45 Lb-ft
Support bracket adjustment bolts	61 N-m	45 Lb-ft
Inlet housing bolts	28 N-m	21 Lb-ft
Inlet housing bolts (high pressure seal carrier)	28 N-m	21 Lb-ft
End shell flange bolts MSS-15 through MSS-75	61 N-m	45 Lb-ft
Series shell flange bolts MSS-15 through MSS-75	61 N-m	45 Lb-ft
Discharge housing retaining clip cap screws	4 N-m	35 Lb-in
Pump shaft nut MSS-15 through MSS-75	68 N-m	50 Lb-ft

Model Capacities

The MSS pump should only be used within the following limits:		
Maximum fluid temperature	49° C[1]	120° F[1]
Maximum working pressure	82 barg	1,200 psig
Maximum inlet pressure	9.7 barg[2]	140 psig[2]
Maximum particulate size	20 micron	-

1 Can be raised with optional modifications. Specific application limits are provided on the name plate of each pump. The duty conditions for each MSS pump, can be found on the back side of the MSS tag. This tag should always stay with the pump.
2 Unless equipped with high pressure seal package.

Operating Parameters

Minimum inlet operating pressure	Refer to Pump Data Sheet
Flow rate necessary to maintain heat dissipation	40% of BEP Minimum
Maximum Pump Flow Rate	150% of BEP Maximum

Flexible coupling

Gap between flexible coupling disc pack and end of motor shaft	3.2- 6.4 mm (0.13"-0.25")

Pump Alignment Specifications

Flange Gap Tolerances for non-uniform gaps		
Good ≥	0.381 mm	0.015"
Acceptable ≥	0.81 mm	0.032"

Lubricants and Compounds

Lubricant ASTM D1257	Standard Glycerine or fresh water with soap
Anti-seize compound	Compliant with specific system

Balance Disc Specifications

Pump Model	Original Thickness When New	Wear Limit - 0.508 mm (0.020")
MSS-15 through MSS-75	13.5 mm (0.530")	13.0 mm (0.51")

Foundation Specifications

Refer to "Foundation Specifications" earlier in this manual.

Electrical Specifications

Refer to "Electrical Connections and Regulations" earlier in this manual.

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Specifications (cont.)

Maintenance

By following the schedule of preventive maintenance presented below, the MSS pump will deliver years of trouble-free performance.

One (1) day after commissioning

1. Recheck pump alignment (refer to Final Pump Alignment).
2. Visually inspect flexible coupling and tighten the coupling bolts to the specified torque as necessary.
3. Fill out and submit all warranty documentation to FEDCO.

Six (6) months after commissioning

1. Inspect pump alignment (refer to Final Pump Alignment).
2. Inspect flexible coupling: check for wear, irregularities, torsional backlash, running behavior and tightening torque (refer to Flexible Coupling Check).
3. Inspect for leaks, damaged gaskets and condition of all pipe couplings.
4. Wipe pump, motor and baseplate with a clean, damp cloth.

Twelve (12) months after commissioning

1. Inspect pump alignment (refer to Final Pump Alignment).
2. Inspect flexible coupling: check for wear, irregularities, torsional backlash, running behavior and tightening torque (refer to Flexible Coupling Check).
3. Inspect mechanical seal for early signs of leakage or failure.
4. Inspect balance disc (refer to Balance Disc).

4a. Note: If balance disc requires replacement, mechanical seal should also be replaced.

5. Inspect for leaks, damaged gaskets and condition of all pipe couplings.
6. Wipe pump, motor and baseplate with a clean, damp cloth.

Annually

1. Inspect pump alignment (refer to Final Pump Alignment).
2. Inspect flexible coupling: check for wear, irregularities, torsional backlash, running behavior and tightening torque (refer to Flexible Coupling Check).
3. Inspect for leaks, damaged gaskets and condition of all pipe couplings.
4. Inspect balance disc (refer to Balance Disc).

4a. Note: If balance disc requires replacement, mechanical seal should also be replaced.

5. Wipe pump, motor and baseplate with a clean, damp rag.

Five (5) Years

1. Annual maintenance per above.
2. Disassemble fluid end for detailed inspection (refer to Overhaul).

Note: Follow manufacturer's recommendations for motor and VFD maintenance.

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Service Policy

Return Authorization Number (RAN)

Please contact a FEDCO before returning any equipment. You must have a Return Authorization Number (RAN) issued by FEDCO before we can accept any parts. All returned parts must be shipped prepaid to FEDCO with the RAN clearly marked on the package. We need this number to ensure proper handling of the returned parts and supply of new parts, if needed. Repair by FEDCO on equipment that is out-of-warranty will be warranted for three (3) months. Ask FEDCO for details of the repair warranty. Parts will be replaced in accordance with the FEDCO warranty. Use the following address to return parts:

ATTN: Field Service Department
FEDCO
800 Ternes Drive
Monroe, MI 48162
USA

Additional Contact Information:
Tel 734-241-3539
Fax 734-241-5173
E-mail : techsupport@fedco-usa.com
Web site: www.fedco-usa.com

Procedure

How to Return Parts to FEDCO

1. Provide FEDCO with the following information:
   - Serial number of unit.
   - Description of why parts are being returned.
2. FEDCO will provide a Return Authorization Number.
3. Pack the unit in the original shipping crate or other suitable crate and clearly mark the Return Authorization Number on the outside of the crate.
4. Send unit, freight prepaid, to FEDCO at the above address.

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Service Policy (cont.)

Warranty

Fluid Equipment Development Company, LLC, (FEDCO), warrants its MSS feed pump to be free from defects in design, materials or workmanship for a period of 18 months from shipment or 12 months from the date of installation of the product, whichever occurs first, when said product is operated in accordance with written instructions and is installed properly.

If the MSS pump is altered or repaired without prior approval of FEDCO, all warranties are void. All equipment provided by FEDCO, including pump motors, must be installed on a rigid, steel support structure and base capable of handling full loads during operation. Failure to do so will void warranty. All equipment must be installed such that there are no pipe stresses on FEDCO equipment. Failure to do so will void warranty.

If the MSS pump is not installed and aligned as per FEDCO Installation and Operation Manual, any subsequent damage to the pump and/or motor will be excluded from the warranty.

If any defects or poor performance occur during the warranty period, FEDCO's sole obligation shall be limited to alteration, repair or replacement at FEDCO's expense, F.O.B. factory, of any parts or equipment, which upon return to FEDCO and upon FEDCO's examination prove to be defective. All parts returned for warranty service must be shipped prepaid and include FEDCO's return authorization number.

Equipment and accessories not manufactured by FEDCO are warranted only to the extent of and by the original manufacturer's warranty. FEDCO shall not be liable for damage or wear to equipment caused by abnormal conditions, excessive temperatures, and vibration or caused by corrosives, abrasives or foreign objects.

The foregoing warranty is exclusive and in lieu of all other warranties, whether expressed or implied, including any warranty of merchantability or fitness for any particular purpose. In no event shall FEDCO be liable for liable for consequential or incidental damages.

Declaration of Conformity

This product fulfills the obligations of the applicable EU directives. The declaration of conformity is a standalone document and can be requested, if required, from FEDCO or any FEDCO representative.

Register the product warranty at the time of installation by completing the Warranty Registration Form on the following page and sending it to FEDCO.

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Service Policy (cont.)

Warranty Registration Form

THIS FORM MUST BE COMPLETED AND RETURNED TO FEDCO TO ACTIVATE YOUR WARRANTY COVERAGE.

FEDCO will send confirmation of start of warranty coverage

Please FAX this page to FEDCO to register your warranty.
Retain the original for your future information.

FAX to: +734.241-5173 (USA) or E-MAIL: techsupport@fedco-usa.com
ATTN: Technical Support

Initial Installation

Model #: _____ Serial #: _____

Installation Date: _____ Startup Date:_____

VFD frequency (Hz) if used _____ Voltage and Hz of power supply_____

Feed Flow: _____

Suction Pressure to Pump: _____ Discharge Pressure: _____

Drain flow rate (high inlet pressure option only): _____

Comments:

_____

_____

_____

_____

_____

Installed by: _____

Telephone: _____ Fax: _____

E-mail:_____

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Service Policy (cont.) Start Up Record

Start Up Check List

1. ☐ Flexible coupling set screws tightened.
2. ☐ Motor adapter guards installed.
3. ☐ All anchor bolts tightened to specifications.
4. ☐ All pipe couplings tightened to specifications.
5. ☐ Motor rotational direction correct.
6. ☐ Motor lubricated to manufacturers specifications.
7. ☐ Final Pump Alignment performed.
8. ☐ Inlet pressure indicator installed.
9. ☐ Inlet pressure switch (if applicable) installed.
10. ☐ Outlet pressure indicator installed.
11. ☐ System pipes are clean and upstream filtration in place.
12. ☐ System leak checked and all air vented from system.
13. ☐ ALL safety devices in place.

Installation and Start-up Information

Start-up Date: _____ Model #: _____

Serial #: _____ Installation Date:_____

Installed By: _____

Operating Conditions

Feed Flow: _____ Suction Pressure to Pump:_____

Discharge Pressure: _____

Drain flow rate (high inlet pressure option only): _____

VFD frequency (Hz) if used _____ Voltage and Hz of power supply_____

VFD Amps: _____VFD Amps (after 48 hours of running time): _____

GENERAL NOTES:

_____

_____

_____

_____

_____

_____

This report has been filled out by: _____Date: _____

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Service Policy (cont.) Overhaul Record

Overhaul Date: _____

Operating Hours: _____

Reason for Overhaul: _____

_____

_____

Operating Data Prior to Overhaul:

Feed Flow: _____ Suction Pressure to Pump: _____

Discharge Pressure: _____

Operating Data After Overhaul:

Feed Flow: _____ Suction Pressure to Pump: _____

Discharge Pressure: _____

GENERAL NOTES:

_____

_____

_____

_____

_____

_____

_____

Overhauled by: _____

Telephone: _____ Fax: _____

E-mail: _____

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